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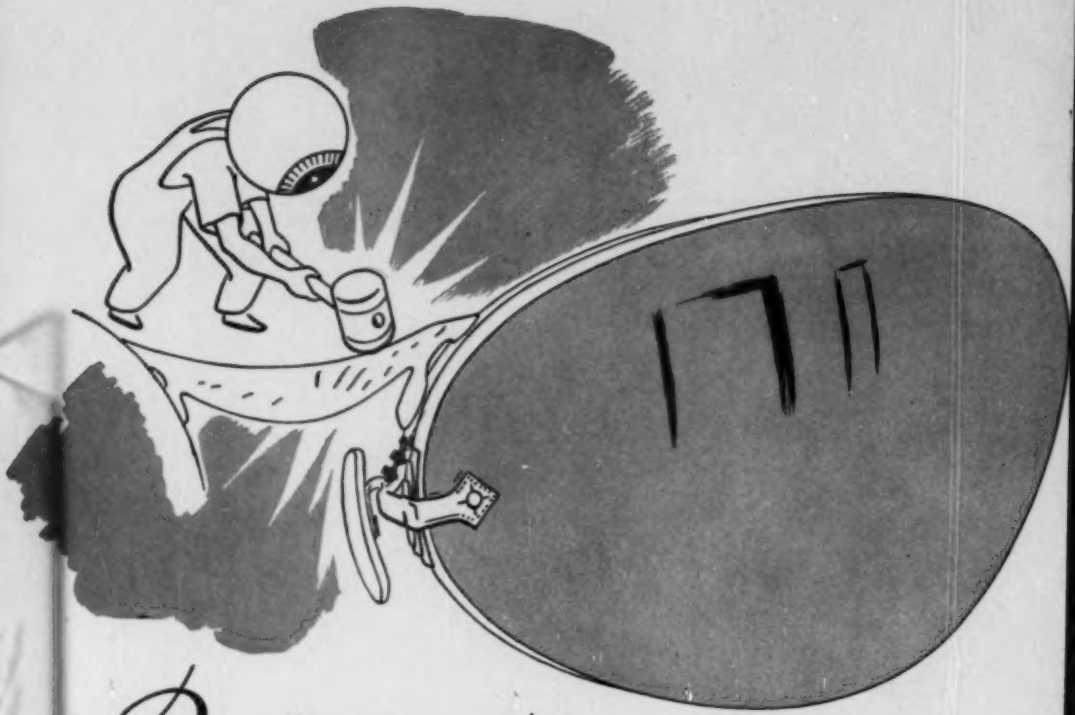

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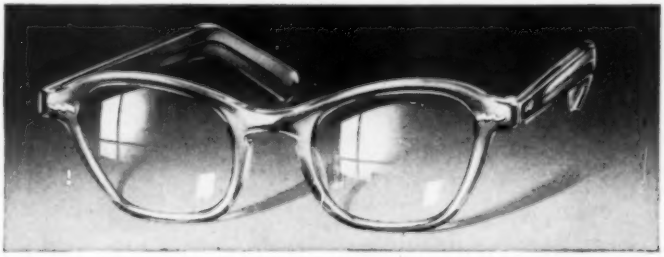

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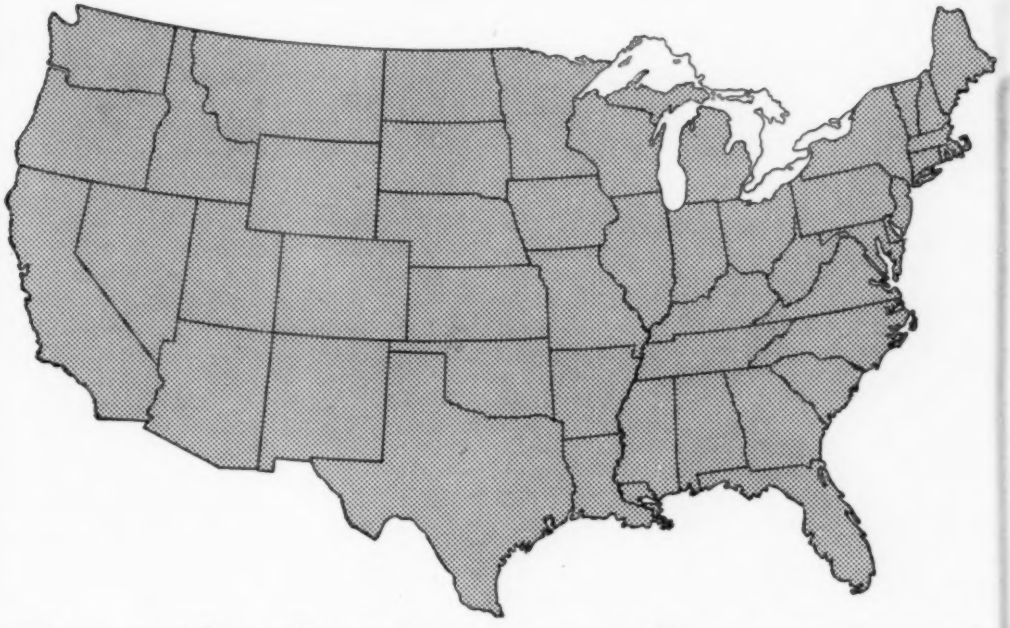

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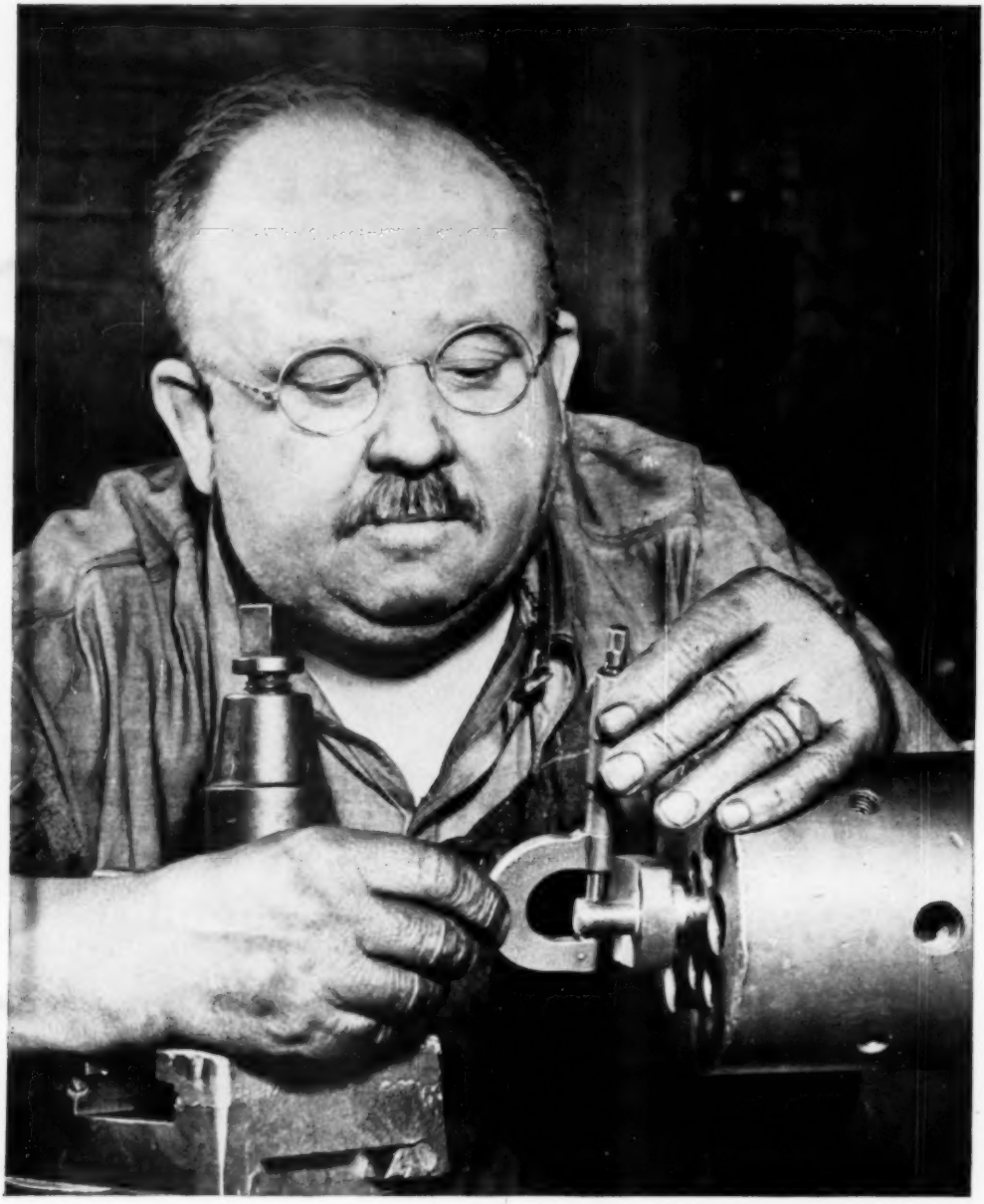

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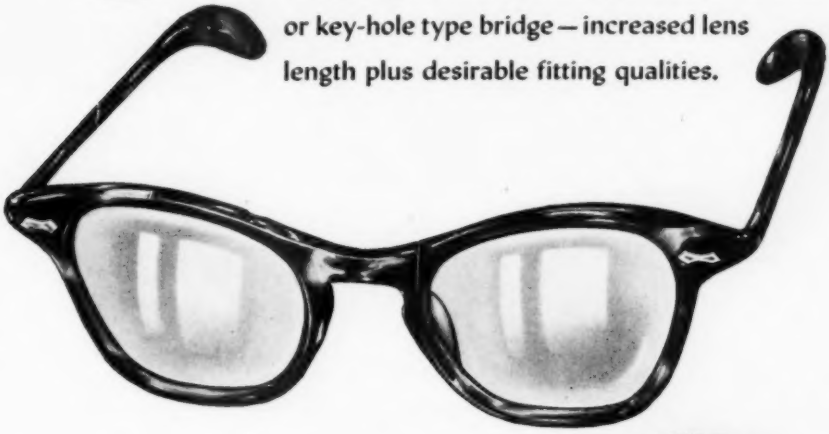

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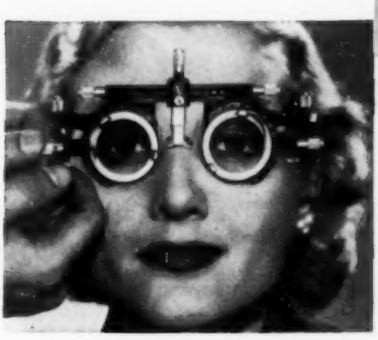

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THE TURVILLE INFINITY BINOCULAR BALANCE TEST*

Meredith W. Morgan, Jr.†
School of Optometry, University of California
Berkeley, California

Optometrists have long sought some method of making the ordinary subjective refraction under binocular conditions in order that the refraction may be made under circumstances more nearly approaching those which exist when the eyes are in daily use. If such a method could be devised, it would allow a better method of checking the balance of the spherical element of the correction between the two eyes, the axis and the amount of any cylindrical correction, and the stability of the binocular mechanism.

When the eyes are ordinarily tested subjectively one eye at a time, the accommodative effort of each eye are assumed to be balanced since the same criteria of subjective refraction is used for each eye. This balance is important since it has been shown by Hess[1] and Stoddard and Morgan[2] that the same accommodative effort is made by each eye so that one is unable to compensate for more than a 0.25 D. of anisometropia as a maximum. Since the two eyes each accommodate the same amount it would appear *a priori* that maximum efficiency will only be obtained when this condition is insured by the proper balance of the spherical element of the optical correction.

The best method in general use for making sure that the accommodative effort is equal is to compare the visual acuities of the two eyes when the vision is slightly blurred. The vision must be slightly blurred in each eye to be certain that accommodation is fully inhibited. The primary objection to this method is that visual acuity is used as

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*Read before the annual meeting of the American Academy of Optometry, Winston-Salem, North Carolina, December 5, 1948. For publication in the June, 1949, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

†Optometrist, Fellow, American Academy of Optometry, Assistant Professor of Optometry.

a basis of checking. One eye may not have as good an acuity as the other and hence this method may lead to erroneous results.

As Sugar[3], Shreve[4] and others have reported that there may be changes in the axis of monocular astigmatism when binocular vision is obtained, it would seem highly desirable to have a method of checking the axis of the cylinder under binocular conditions. This change in axis may be due to a cyclofusion movement initiated to overcome an initial cyclophoria. It might also be due to torsion movements which are secondary to other fusion movements. There also is the possibility that accommodative astigmatism might exist and cause some difference in the axis and the amount of the astigmatism. Ordinarily we would not expect these movements to exceed 5°, which for small amounts of astigmatism, is probably of little consequence. However, if a check could be made on the amount and axis of the cylinder when binocular vision exists, any change could readily be measured and compensated for.

A method for the measurement of the stability of binocular function is highly desirable. Binocular testing would offer a means of detecting suppression, vertical imbalances, lack of stereoscopic vision, cyclophoria, lateral imbalances, and the ability to maintain fusion. Many different tests have been designed to measure these functions. The tests generally used for the detection of suppression, degree of stereopsis, and the ability to maintain fusion generally employ a stereoscope. Unfortunately the stereoscope at best offers a highly artificial testing situation. The fixation distance is generally maintained at infinity by optical methods even though the subject always knows that the test chart is really very close to his eyes. This could well upset the normal neuromuscular activity since the optical situation differs markedly from the psychic one.

A search of the literature reveals many different proposals for methods of binocular refraction. The fact that none of these methods is popular may be due to the difficulty or the inexactness of the testing method. However, it may also be that these methods have never been given a fair trial because they are not generally known. It therefore seems appropriate to present some of them briefly.

Copeland[5] has proposed that the eye not being tested be fogged by the addition of a +2.00 D. Sph. to the skiametric finding. This blur, while destroying the possibility of acute perception by this eye would, nevertheless, still allow proper fixation. Luckeish and Moss[6] have designed an instrument using a neutral filter to destroy acute perception in the eye not being tested at the moment. These two methods both suffer from the fact that rapid shifts from the right to the left eye

and vice versa may not be made. The method of Luckeish and Moss also gives results which are approximately 0.50 D. to 1.00 D. less convex than those found by routine methods.

The haploscope has been used for binocular refraction for some time. However, the results obtained by haploscopic examination are not clinically acceptable as far as the spherical element of the lens combination is concerned. Ordinarily the haploscopic refraction gives results about 0.50 D. to 1.00 D. less convex than does subjective refraction. This probably represents the depth of focus of the eye. In routine refraction the attempt is always made to place the zone of the depth of focus in advance of the retina when the eye fixates a target at 6 meters. This is inferred from the general practice of using that maximum convex lens or minimum concave lens which gives maximum acuity. When the haploscope is used, either the brightest zone of the aberration bundle or the zone having the smallest diameter is put astride the retina. This, of course, means that the prescription found by haploscopic examination would probably have to be modified by the addition of convex sphere if these lenses were to be worn by the patient. The main objection, however, to the haploscope is that it is not a commercially available instrument.

Many optometrists have, of course, been intrigued by the possibility of using polaroid filters to separate the eyes in the foveal portions of the field of view. The Leland refractor employs polaroid filters for this purpose. A report of the results obtained using the Leland refractor has been made by van Wien.[7] The primary difficulty with using polaroid is the need for special apparatus and fairly high levels of illumination.

Complementary colors may also be used to dissociate the central visual areas of the two eyes. For example a red field may be eliminated by using a red-free filter before the eye. Similarly a greenish field may be eliminated by using a red filter. This method has been described by Shreve[4] for the testing of astigmatism with a clock dial. The objection to this method is due to the chromatic abberation of the eye, which induces at least a spherical error.

Sugar[3] has pointed out that the axis of the cylinder, at least, may be determined with binocular vision using the cross cylinder. This requires no special apparatus. The results, however, given by Sugar are not very impressive.

In 1946, A. E. Turville* published privately a booklet entitled,

*Optometrist. Fellow, American Academy of Optometry. 108 Abington St., Northampton, England.

"Outline of Infinity Balance"[8] in which he described a special apparatus for testing under binocular conditions. The essential idea of Turville's is that a flat septum with a width of several centimeters, may be used to separate the foveal area of the two eyes providing the test letters are in double vertical columns. A mirror used in conjunction with the septum offers the easiest method of application. This can be seen by

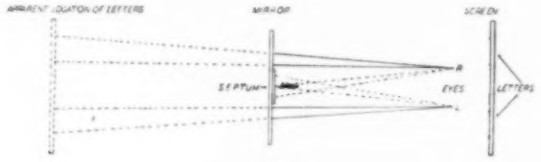

Fig. 1

inspection of Figure I showing a plan view and Figure II showing the patient's view.

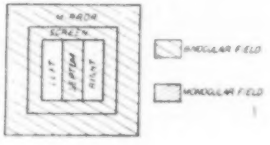

Fig. 2

To quote Turville, "The Turville Infinity Balance Test is a means to a more accurate prescription of lenses which afford comfortable natural equality of effort of the eyes. It comprises apparatus and technique having for their purpose the simultaneous comparison of uniocular images made under binocular conditions of examination at six meters distance. In other words, each of a pair of eyes may be examined and refracted singly by subjective methods whilst normal binocular vision is in play, the object being to disclose visual and refractive differences as between one eye and the other, and to provide facilities for balancing differences, by modifications of, or additions to lenses which would ordinarily have been prescribed as a result of conventional monocular examination.

"Basically, the apparatus for carrying out the technique consists of a chart bearing two imprints (usually letters). These imprints are viewed through a mirror having a central obscuring strip 3 cms. wide, in such a manner that when patient, chart and mirror are properly positioned relative to each other the patient sees in the mirror only one imprint with the left eye (to the left of the septum) and the other

imprint with the right eye (to the right of the septum) whilst seeing the other part of the chart binocularly through the periphery of the mirror."

While it is true that Turville has designed a special test chart and mirror to accomplish the desired aim, this relatively simple method of dissociating the foveal areas may be obtained by the use of any chart having two vertical columns of letters separated by a moderate space such as is found on the Robinson-Cohen slide used with the American Optical Company Projecto Chart. All of the measurements reported in this paper were made using this particular slide. The septum may be a card covering a section of the mirror.

The method of testing the Turville system was to refract 200 consecutive patients by a modified Turville technique to be described below. The lenses determined by this method were prescribed without regard to the results of other tests or even the judgment of the writer. Actually 215 subjects are included in this report.

The method used in refraction was to first perform a normal routine refraction consisting of the usually included tests: static skiametry, subjective, phorias, ductions, monocular and binocular cross cylinder, dynamic skiametry, supplementary convergence, gradient, positive and negative relative convergence, positive and negative relative accommodation and accommodative amplitude. After completion of the routine refraction, the subjective finding was inserted in the phoropter. The septum, cut from a dark blue blotter, was put in place and the section of the Robinson-Cohen slide starting with the 20/50 row of letters (PT 95) was presented. The patient was then asked to compare the right side with the left side to see if the visual acuities were balanced. Then each side in turn was altered by a 0.25 D. Sphere, plus and minus, to see if the visual acuity could be improved. Frequently, the addition of a +0.25 D. S. to one side will improve the vision of that eye, even in a young person.

If the eyes are balanced, the average patient easily detects the blurring caused by the addition of —0.50 D. S. to the eye being tested. The ability to detect changes before one eye was tested in the 215 subjects covered in this report. Statistically the limit of variability on the minus side was —0.20 D. ± 0.17 D. and the limit on the plus side was +0.15 D. ± 0.09 D. The Turville method thus appears to give a reasonable possibility of balancing the accommodative effort of the two eyes within the desired limit of ± 0.25 D.

After the spherical element was balanced, the 20/50 row of letters was presented by itself and the axis and amount of the cylinder was

checked using the flip cross cylinder method. If any change was made in the cylinder, the spherical element was rechecked.

In 20 per cent of the subjects tested there was a change in the spherical element of one correction lens of at least a 0.25 D., using the Turville method as compared to the routine subjective. In 2 per cent of the subjects, this change was more than 0.50 D. In 2 per cent of the subjects there was a change in axis of the cylinder of 10° or more when binocular condition existed. In none of the subjects covered in this report was there a change of more than a 0.25 D. in the cylinder. Since the subjects in which there was change in the sphere of a 0.50 D. or more were different than those in which there was a change in the axis of 10° or more, there were 4 per cent of the patients tested giving significantly different results by the Turville method than by the usual monocular techniques. If the general criteria of accuracy of the prescription are used: namely, patient satisfaction, maximum acuity under the circumstances, and repeatability of the data, the prescriptions arrived at by the Turville method are highly satisfactory.

After checking the sphere and cylinder of the prescription as outlined above, the 20/30 line was separated out and the patient was asked whether the two sides were level. The ability of patients to detect a difference in the vertical position of the two halves of the 20/30 line was tested. Practically every patient (98.6 per cent) can detect a difference in level of the two sides of the chart created by a 0.5Δ prism. During the period covered by this report, the amount of prism required to cause the two halves of the chart to appear level was recorded as the hyperphoria. In 32 cases out of 215 cases used in this study, vertical prisms were prescribed on the basis of this measurement. To date, 10 months after the last of these cases, only two changes have been made in these prescriptions. In both of these cases, the subject was over 50 years of age and did not have binocular vision by the Turville test unless the vertical prism was used. Neither of these patients was able to make the necessary adjustment to binocular vision.

After the check on the vertical deviation, the circles designed for the bichrome test of the Robinson-Cohen slide were presented. Base-out prism then was added until the right and left circles fused. According to mathematical analysis of the writer's set up, the addition of 1Δ base-out should make the two sides coincide. However, since peripheral fusion was present, most patients did not fuse the two halves when this amount of prism was added. Figure III gives the distribution of prism necessary for fusion in the 215 consecutive cases. Figure IV gives the phoria distribution in these same cases.

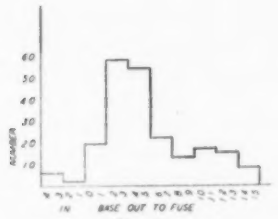

Fig. 3

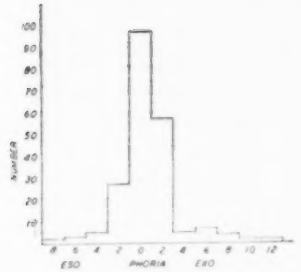

Fig. 4

PHORIA	IN 4	IN 2	BASE OUT TO FUSE 0	2	4	6	8	10	12	14
ESO 8					1				1	
6						1	1		1	
4				1				3	1	
2			1	5	5	5	2	6	4	3
0	1		3	26	31	10	9	8	5	4
EXO 2		1	9	28	16	5			3	1
4		1	3	1						
6	3	1	1	1		1				
8	1		2	1						
10			1				1			
12	1				1					

Fig. 5

It might be thought that the degree of prism required for fusion is related to the phoria. On the whole this is true, but inspection of the scattergram shown as Figure V fails to show any significant correlation—if we assume normal distribution, the coefficient of correlation is approximately +0.3 between phoria and base-out prisms to fuse.

A similar lack of correlation exists with respect to the blur and break of adduction and the break of abduction. The correlation, however, is +0.60 with the recovery of adduction and —0.76 with the recovery of abduction.

This means that the amount of prism base-out required to break peripheral fusion and established central fusion in the Turville method cannot be predicted from the phoria or the duction measurements as routinely performed.

In some cases (6) the targets could not be maintained separately without the addition of base-in prism. As a tentative normal, 2Δ base-out was taken as the lower limit for fusion. Thus, there were 27 subjects falling below this arbitrary limit. All 27 of these patients were given base-in prism in their prescription. All of these corrections have proven to be satisfactory.

On the overconvergence side of horizontal imbalance, the results as can be seen from Figure III are not as definite as on the underconvergence side. In a few cases there was found to be an esophoria of an appreciable amount and yet fusion was obtained with a small degree of base-out prism.

By adding a small spot above each of the two smaller circles of the Robinson-Cohen slide giving a parallactic displacement of 35 seconds, stereoscopic vision was also checked when the two circles are fused.

One of the striking effects found using the Turville method, is that of suppression. In checking the alignment of the eyes relative to the septum, the left eye will see the left chart when the right eye is covered and the right eye will see the right chart when the left eye is covered. However, when both eyes are opened one chart or the other may disappear. In the 215 test cases some six cases indicated suppression of central vision in one eye. Two of these patients had binocular vision restored by the addition of vertical prism, two had binocular vision restored by the use of base-in prism, one had binocular vision restored by the addition of +0.75 D. S. to the suppressing eye, and the sixth had binocular vision restored by orthoptics. Checking this factor in 1,000 consecutive cases, indicates that between 1 per cent and 2 per cent of routine patients will give evidence of suppression. Of these patients with suppression, about 40 per cent will stop suppressing when prism either vertical or base-in is added, about 40 per cent will be favorably influenced by the addition of convex lens power to the suppressing eye and about 20 per cent will need treatment other than refractive. The Turville method, therefore, allows one to check on various methods of treatment.

To summarize: The Turville method of subjective refraction was applied to 215 consecutive patients. The prescription determined by this method was given each patient regardless of the results of other tests and even against the writer's judgment in some cases. In slightly

less than 10 per cent of these subjects the prescription departed significantly from that which would have been given ordinarily. The prescription was changed in three out of these 21 cases at a subsequent date, two because of binocular difficulties arising from the incorporation of vertical prism and the third because some latent hypermetropia became manifest. A significant departure was assumed to be more than a 0.50 D. difference in the sphere, more than a 0.25 D. difference in the cylinder, 10° or more difference in the axis of the cylinder, and/or the incorporation of prism power in the prescription.

After using the Turville method for over one year, the writer's enthusiasm for it, as an addition to routine refraction, is greater rather than less. Of course, it is not a sure-fire, fool-proof method of satisfying every patient. It is an important addition to routine refraction, perhaps as important as the flip cross cylinder. The writer no longer applies the results blindly as was done during the testing period, but he now modifies the prescription as indicated by the other tests and sometimes by intuition only based on previous experience.

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ABSTRACTS

PRESCRIPTIONS FOR OCCUPATIONAL GLASSES. J. W. Overton. Sight Saving Review, 18, 3, 129-134, 1948.

The need for special focus occupational glasses in industry is stressed by the author. This naturally requires a job description from the patient as well as an exact knowledge of working distances and work characteristics such as detail discrimination, field requirements, lighting conditions, glare, color requirements and ocular hazards. The author finds that compromise corrections are usually bad and that workers must be given exact corrections which properly meet working requirements. He also suggests occupational orthoptics for some. 2 charts.

C. C. K.

ANISEIKONIA AND BINOCULAR VISION*

Robert E. Bannon†
School of Optometry, Columbia University
New York, New York

The close connection of the ocular sensorial and motor apparatus is the basis of binocular vision. The stimulation of corresponding retinal points results in a single sensation which is localized in space in the one and the same direction and at a distance corresponding to that of the point fixated. When peripheral retinal points are stimulated, the motor apparatus works like a reflex mechanism, the amount and direction of the movement of the eyes being determined by the distance between the stimulated peripheral points and the fovea, as well as by the direction of such peripheral points from the foveae. The movements resulting from the stimulation of corresponding parts of the retinae are equal and parallel movements.

When the distance of objects from the eyes is great, a large number of the images will be on corresponding retinal areas. However, in near vision very few images are formed on corresponding parts of the retinae but the images of most near objects are formed on non-corresponding, or disparate, points. Such objects will either be seen as single or double depending upon the extent of the disparity and the individual's fusional amplitudes. If disparate images are fused and seen singly, they will appear to be at different distances from that of the plane fixated. This is the basis of depth perception.

The degree of retinal disparity that the fusion apparatus can cope with in the interest of binocular single vision varies in different individuals. The fusion apparatus may be compared to a reflex mechanism consisting of a sensorial and a motor portion. When attention is directed to an object which forms disparate retinal images, the stimulation reaching the cortex will be conveyed to the motor centers controlling fusional movements. There are three pairs of antagonistic fusion movements: in the horizontal directions, convergence and divergence; in the vertical directions, positive and negative divergence (according to whether the right eye moves up or down or the left eye moves in the opposite direction); and also the rotations of the eyes around

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†Optometrist. Assistant Professor. Fellow, American Academy of Optometry.

the visual axes, conclination and disclination (according to whether the tops of the vertical meridians converge or diverge).

The equal and parallel eye movements resulting from stimulation of *corresponding* retinal areas and the unequal fusional eye movements resulting from stimulation of *disparate* retinal areas both obey the law that every motor impulse goes equally to both eyes. There is, therefore, often necessary a complicated, but marvelously exact, dual adjustment of the eye movements when a nearby object is situated, for example, to the right of the primary direction of gaze. In such a case, the resultant eye movements must be unequal. Nevertheless, the *innervations* go equally to both eyes. Unequal eye movements as a result of equal innervations may seem a contradiction or even impossible. The explanation is that an impulse producing a parallel movement (viz., dextro or levoversion) is combined with an impulse to move the eyes in opposite directions (viz., convergence or divergence). The combination of both impulses will cause one eye to move more than the other or one eye may not move at all while the other does move, if both impulses are equally strong.

Under the usual conditions of vision and when there is orthophoria, the most frequently used fusional movements are the contralateral fusion movements which change the visual axes from parallelism to convergence and back again from convergence to parallelism. The amplitude of the convergence movements is large in comparison with the others. The great importance of the fusion movements is evident in cases of heterophoria where there would be diplopia unless the fusion apparatus prevented it by appropriate compensating innervations and eye movements. However, as is well known, the necessity of having to make these compensating innervations and movements is sometimes fatiguing and may lead to the frequent symptoms of asthenopia, headaches, nausea and even diplopia. These symptoms do not arise because the extrinsic eye muscles, themselves, are too weak. As Lancaster[1] has pointed out, the muscles are about a thousand times stronger than they need be for the tasks imposed upon them. It is the constant demand for the fine and exacting adjustments in the innervations that accounts for the symptoms which occur as a result of heterophoria.

While the amplitude of the fusion movements is limited, nevertheless, the limits are not fixed but differ in the same individual, depending upon whether he is fresh and attentive or tired and distracted. Furthermore, the range of the fusional amplitudes may be increased by training and practice, as those who give orthoptics have attested.

What are the different factors which may cause an insufficiency or

a complete lack of fusion?

If one does not know the etiological factors in a case, it is very difficult to relieve the patient's symptoms. One cannot judge well from the symptoms alone what may be the underlying anomaly since many different conditions produce the same or similar symptoms.

Lack of fusion is not due usually to a single factor. There are two or more etiological factors in most cases. These may be summarized, as follows:

1. MECHANICAL FACTORS: Such as abnormalities of the insertion, length, elasticity or structure of the extrinsic muscles; abnormalities in the size and shape of the orbits or the bulbi; abnormalities of the retrobulbar tissue, etc. These mechanical factors cause a deviation of the eyes (strabismus) which is often beyond the power of the fusion apparatus to keep latent.

2. INNERVATIONAL FACTORS: Excessive or spastic motor innervations, commonly found in uncorrected hyperopic cases, has been long recognized as a burden to the fusion apparatus and accounts for most cases of concomitant convergent strabismus. Alternating, or dissociated, hyperphoria is another example of an innervational anomaly.

3. FUSIONAL DEFICIENCY: There may be a weakness of the fusion faculty, itself, from congenital origin or from toxic or other influences (meningitis, encephalitis,, etc.) which when combined with faulty mechanical condition and/or abnormal innervations may result in a strabismus.

4. SENSORIAL ANOMALIES: The visual sensations from the two retinae must have nearly equal weight in order to adequately influence fusion movements. If one eye is blind or highly amblyopic, there are no fusion movements. Therefore, such disturbances as unequal visual acuity, differences in illumination, the differential prismatic effects of highly anisometropic correction and an inequality in the size and/or shape of the ocular images (aniseikonia) contribute a burden to the fusion faculty.

It is the purpose of this paper to discuss briefly the role of aniseikonia as an anomaly of binocular vision and as an important etiological factor in certain cases.

There are several points of evidence that aniseikonia is an obstacle to comfortable binocular single vision. In cases of monocular aphakia, the relative difference in image size is of the order of 25.0% to 30.0% when the ametropia is corrected with spectacle lenses. The correction[2] of the aniseikonia in several cases has resulted in binocular single vision with depth perception and fusional amplitudes. Unfortunately, the

cumbersome spectacle correction is not practical in many cases. Contact lenses do offer a better solution, but they also have their limitations, especially in wearing time.

Next, monocular occlusion,[3] which disrupts binocular vision, has brought relief to many patients suspected of having aniseikonia and the subsequent correction of the aniseikonia with continued relief of symptoms supports the importants of aniseikonia as a binocular anomaly.

Thirdly, it has been found frequently that the correction of an existing aniseikonia may reduce, or remove completely, the need for prisms which indulged an exophoria, for which, prior to the aniseikonia correction, the patients's fusional amplitudes were inadequate.[4]

Furthermore, aniseikonia causes errors in binocular spatial localization[5] which in turn are responsible for fusional difficulties since there arises a conflict between the monocular and the binocular clues used for the correct localization of objects in space.

Just as everyone has some degree of heterophoria, so also everyone has some degree of aniseikonia. Heterophoria is compensated for by the neurophysiological mechanism and does not always result in discomfort. However, if the degree of heterophoria is large in relation to the individual's fusional amplitudes, discomfort in one form or another may result. Likewise, in aniseikonia of small amounts the adjustments necessary to fuse the slightly disparate images cause no difficulty. However, if the aniseikonia is large enough in relation to the individual's tolerance, the exacting fusional adjustments result in discomfort or even diplopia.

The following cases will illustrate the influence of aniseikonia in binocular vision:

Case No. 1: Mr. A. O., age 29, a machinist, complained that he had never been able to see well with his right eye and that he experienced severe asthenopia and headaches while at his work, which had become more exacting in recent years. He knew that he did not use both eyes together and that he was a poor judge of objects in space. He was wearing the following glasses:

R. +1.00 D. Sph. (5/200)
L. +1.00 D. Cyl. x 70 (20/20)

Our refractive examination disclosed:

R. —6.75 D. Sph. (20/20)
L. +1.25 D. Cyl. x 65 (20/20)

With this correction, the patient had constant diplopia, the deviation being: 8 to 12Δ exotropia with 2Δ L. hypertropia for distance and 14 to 18Δ exotropia with 2Δ L. hypertropia for near. When the

angle of squint was corrected with prisms, the patient had single binocular vision in the primary position but no depth perception: in the secondary directions of gaze, he saw double.

Tests for aniseikonia indicated that the right ocular image was relatively smaller than the left to the extent of 14.0% overall with 4.0% x 90. When the aniseikonic correction in fitover form, added to the refractive correction, had been worn a few hours, the patient had single binocular vision, fusional amplitudes and depth perception. After wearing the aniseikonic correction in fitover form for one month, the patient reported complete relief of his symptoms. During the month's trial, he had taken off the aniseikonic fitovers on a few occasions, only to experience diplopia and a return of his discomfort.

It is interesting to note in the above case that, when the myopia of the right eye was corrected, the patient had good vision with that eye immediately. It is not always true that an amblyopia develops in an eye having an uncorrected ametropia. When the image of each eye was made clear, the considerable difference in image size prevented fusion. However, when the images were made more nearly alike in size, as well as in clearness, binocular vision with depth perception was realized. It is very likely that this patient did have binocular vision in his youth before the development of the high myopia of the right eye. This assumption is warranted in view of the speed with which binocular vision was established once the dioptric anomalies were corrected and each eye provided with images similar in clearness and size.

Not all cases of strabismus associated with aniseikonia result in a quick solution. Sometimes there is anomalous retinal (or sensorial) correspondence which make it very difficult, if not impossible, to obtain an estimate of the relative size of the ocular images. In other cases, the angle of squint is too great to be overcome by the fusion faculty, even when the visual acuity and the size of the images have been corrected. Sometimes surgery or orthoptics or a combination of both is necessary before binocular vision and comfort is attained.

The following case is an example of a more complicated problem in which several factors were involved and had to be considered before binocular vision was possible:

Case No. 2: Mr. K. E. H., age 22, college student, complained of headaches and eye fatigue after studying. He knew that his eyes were not straight since the age of eight years but that one or the other turned outward. He had never seen double but he used the left eye for distance vision, suppressing the right image, and for close work he used the right

eye, suppressing the left. He knew which eye he was using since objects appeared smaller with the right eye.

He was wearing:

R. —5.50 D. Sph. ⌒ —1.00 D. Cyl. × 5 (20/20)
L. —0.50 D. Sph. (20/20)

Objectively, the angle of squint was about 30Δ exotropia. There was anomalous correspondence in the double image test and in the after-image test.

Following a bilateral advancement of the internal recti muscles and three months' orthoptic training, the angle of squint was about 10Δ esotropia.

Also, there was normal sensorial correspondence but fusion could be elicited for only short periods. However, after many trials the patient could finally maintain fusion on the eikonometer long enough to measure an aniseikonia which was corrected by R. 6.0% overall. It took a total of six visits before reliable measurements could be obtained.

After wearing the aniseikonic correction in fitover form for six months, the patient reported that he had been able to use both eyes together for long periods without discomfort. Re-examination showed binocular single vision with depth perception and fusional amplitudes.

This case differs from the first one in that it is very likely the patient never had normal binocular vision. The angle of squint was considered sufficient to warrant surgery; the anomalous correspondence had to be broken down; simultaneous binocular perception had to be established; superimposition and fusion movements had to be trained; the tests for aniseikonia were very unsatisfactory at first because of the poor fusion and many repeated readings had to be taken. The patient had to spend the better part of a year in order to complete all the steps on the tedious road toward binocular vision which was finally achieved.

Another point that should be mentioned relative to the above case is the connection between the symptoms of discomfort and the binocular anomaly. When there is a strabismus, it is sometimes assumed that discomfort cannot be due to binocular factors. Since there is no evidence of fusion or of an effort to overcome the angle of squint, the common belief is that no discomfort should be experienced. Likewise, suppression seems to be considered an effortless act. That these assumptions are fallacious can be proven in some cases by monocular occlusion[3] or, as was done in the above case, by the correction of the binocular anomalies with resulting comfort in the use of the eyes binocularly.

Even more striking and much more difficult to cope with are cases of "horror fusionis." Fortunately, these cases are rare. In 1935, Biel-

schowsky[6] published the details of a case of "horror fusionis" which led him to consider aniseikonia as one of the etiological factors in strabismus. As a result of the success of an aniseikonic correction (L. 11.0% overall with 4.5% × 150) in the restoration of binocular vision in the case which he reported, Bielschowsky concluded:

> "Henceforth, we shall have to look, in every case of weak or defective fusion, for aniseikonia as a possible origin of the fusional anomaly. Aniseikonia seems to be an important etiological factor, not only insofar as it involves an incongruence of the ocular images, like ametropia or other conditions impairing the visual acuity, but because it may produce anomalous nervous irritations, as well as a weakening of the physiological fusion mechanism, either in its sensorial portion, by favoring suppression, or in the motor portion, by checking the fusion innervation on account of a mental antipathy toward the fusion of heterogeneous ocular images."

Another case of "horror fusionis" in which the correction of an aniseikonia resulted in comfortable binocular vision was reported recently by Treleaven and Bannon.[7] In this case, as well as in Bielschowsky's, several operations on the extrinsic eye muscles had been performed; orthoptics had been tried and refractive and prismatic corrections were given prior to the aniseikonic correction of: R. 6.0% overall and L. 4.0% × 45.

Anyone who has had to deal with a stubborn case of "horror fusionis" knows that it has usually been futile to spend time and effort on it in the attempt to obtain binocular vision. These cases are characterized by a diplopia frequently setting in after orthoptics, or an operation for strabismus, which has made the eyes practically straight and thereby forces attention to both images, one of which could formerly be suppressed when the angle of squint was large. The very slight, but unsteady, separation of the double images is very annoying to the patient. Hitherto, the treatment resorted to was to encourage suppression of one of the images by shifting it, by means of a prism, to a peripheral part of the retina or by partial or total monocular occlusion.

Another patient who had a persistent "horror fusionis" which was relieved by an aniseikonic correction is as follows:

Case No. 3: Miss L. G., age 37, a schoolteacher, had suffered from severe headaches, vertigo, nausea, and asthenopia for nearly twenty years. The patient maintained that her life had been practically ruined by her discomfort which she definitely traced to the use of the eyes. Besides the above symptoms, the patient had a very annoying diplopia which began after several periods of orthoptic training. The patient had found that she was much more comfortable with one eye covered and she had used this as a means of being sufficiently comfortable to do her work.

The patient was wearing

R. +2.00 D. Sph. (20/100)

L. +1.00 D. Sph. $\bigcirc$ —0.50 D. Cyl. × 180 (20/15).

The patient reported that she had worn glasses which gave her much better vision with the right eye but then she was more uncomfortable and much more aware of the double images.

Our refractive test disclosed:

R. +8.00 D. Sph. $\bigcirc$ —5.00 D. Cyl. × 15 (20/30)

L. +1.00 D. Sph. $\bigcirc$ —0.50 D. Cyl. × 180 (20/15)

With this correction, as well as with her former correction, there was an esotropia of 5Δ and constant diplopia.

Tests for aniseikonia disclosed: L. 2.0% overall with 6.0% × 15.

The size correction was added to the refractive lenses and after three months the patient reported that she had comfortable binocular single vision and that she was able to do her work with comfort.

Subsequently, we had the patient fitted with contact lenses and she has been able to wear these for two to four hours a day.

The above case is interesting because of several factors. The patient had tried for nearly twenty years to obtain comfort in the use of her eyes. She had had several sessions of orthoptics which resulted in greater discomfort because she was made more aware of the double images. It required the matching in size of the two images by an aniseikonic correction before comfortable binocular vision could be obtained.

More frequent and easier to handle are cases of aniseikonia in which there is some deficiency of fusion, but in which there is binocular vision most of the time. Examples of such cases are given below:

Case No. 4: Mr. G. W., age 21, a college student, complained of periodic diplopia and asthenopia for all uses of the eyes but more pronounced for close work. He had worn for the past two years:

R. Plano $\bigcirc$ 3½ Δ B. in

L. Plano $\bigcirc$ 3½ Δ B. in

He had also received two periods of orthoptic training of three months' duration. His visual acuity was 20/20, without correction, in each eye. Refractive tests indicated —0.25 D. Sph. O. U. which gave 20/15 in each eye. For distance, he had 16 Δ exophoria and, for near, 20 Δ exophoria.

Aniseikonic tests indicated: R. 3.0% overall.

The patient was given the correction for aniseikonia only. After wearing it for one month, he reported that he had not seen double once and that he was entirely comfortable. In order to test his statements, we had the patient wear his prismatic correction again: but after two

weeks, he maintained that he had been much more comfortable with the aniseikonic correction.

Case No. 5: Mr. H. A. G., age 36, a salesman, complained of dizziness, asthenopia, and frequent diplopia while driving and while reading. These symptoms had been present off and on for about twenty years. He had had numerous pairs of glasses, with and without prisms, and he had had several sessions of orthoptics. A comprehensive report from the referring doctor stated that the patient could be made comfortable for a few weeks following a month of intensive convergence training. However, after a few weeks the symptoms would re-occur and a recheck would indicate that the convergence ability had become deficient again. This sequence was repeated many times over a five-year period until finally base-in prisms were prescribed and the patient would be fairly comfortable for a month or two, after which, by an increase of the prisms, the patient would be relieved for another short period, and so on.

When we first saw the patient, he was wearing:

R. —0.50 D. Sph. $\bigcirc$ —0.50 D. Cyl. $\times$ 170 $\bigcirc$ 5 Δ B. in (20/15)

L. —0.25 D. Sph. $\bigcirc$ —1.50 D. Cyl. $\times$ 75 $\bigcirc$ 6 Δ B. in (20/15)

Our refractive examination resulted in substantially the same findings as above. The phoria tests disclosed a very unstable binocular condition: for distance, the readings varied from ortho to 16 Δ exo to 4 Δ eso to 10 Δ exo, etc.: for near, the variations were even greater. At the first moment of dissociation, there was practically orthophoria, then gradually the eyes would diverge until suddenly the patient made a convergence impulse resulting in esophoria. Because of such an indefinite and spastic muscle balance, monocular occlusion[3] was prescribed for two weeks. During this period, the patient was quite comfortable, which indicated that the basis of the symptoms was some binocular anomaly. Following the two weeks' monocular occlusion, there was a consistent measurement of 1 Δ exo for distance and 5 Δ exo.

Aniseikonic measurements indicated:

R. 1.0% $\times$ 170

L. 2.0% $\times$ 75

After wearing for two months the aniseikonic correction combined with the refractive correction, the patient reported complete comfort. A re-check at the end of two years showed normal muscle balance and good fusional amplitudes with no return of discomfort reported by the

patient. In fact, the patient mentioned that this period of two years was the longest he had ever experienced in twenty years.

Of course, there are cases in which aniseikonia is not the cause of binocular dysfunction or of symptoms. Also, aniseikonia may co-exist with heterophoria and there may be the need for prisms and/or orthoptics as well as the aniseikonic correction. As previously mentioned, there is not often—rarely so, in fact—a single cause for most anomalies. The cases reported herein were selected to show predominantly the effect of aniseikonia. However, it is not implied that aniseikonia is a cure-all. To the contrary, it is present usually in addition to other difficulties.

The queston is asked often: what is a clinically significant amount of aniseikonia? As is well known, people vary greatly in their sensitivity and in their tolerances. An ocular anomaly that is clinically significant for one individual may not be for another. Symptoms[8] do not depend alone on the degree of anomaly but also upon the patient's occupation, his general health, mode of living, temperament, physical and mental stability and reserves. An uncorrected hyperopia of 1 D. cannot be tolerated by one individual without distressing symptoms, whereas another person with 2 D. or 3 D. of uncorrected hyperopia will have no discomfort. Heterophoria of 1 Δ or 2 Δ is often clinically significant; yet, one occasionally sees a patient with 3 Δ or 4 Δ of uncorrected heterophoria who has good binocular vision and no symptoms. Analogously, patients with a high sensitivity or a low tolerance for relative image size differences are more affected by a much smaller amount of aniseikonia than patients with a low sensitivity and a high tolerance.

The general experience of aniseikonic clinicians is that an image size difference of 1.0% is significant. It is important to emphasize this point that such a small difference is capable of producing symptoms. The image size difference most frequently measured in clinical cases has been found to be between 1.0% and 2.0%. These cases usually have good fusion and depth perception, but in cases of aniseikonia over 3.0%, there begins to be a definite impairment of binocular vision. In cases having more than 5.0% difference in the relative sizes of the ocular images, binocular vision is usually very imperfect or it is entirely absent under the normal conditions of seeing.

Any factor which alters the character or worth of an impression registered on the retina has a decided effect upon the resulting mental combination. One of the best illustrations of the effect of altering the image of one eye only is the Pulfrich stereophenomenon. If a smoked glass is placed before one eye, viz., the left eye, while one observes a pendulum that is swinging from side to side, the pendulum seems to

swing in an oval orbit, moving toward the observer and in front of its normal line of motion as it passes from right to left. On the return trip, that is, from left to right, its path is apparently behind the normal plane.

If the smoked glass is made darker and darker, there will come a point at which combination of the two images is apparently no longer possible, and the pendulum again swings in the normal plane: but it will now be found that the poorer image is suppressed and that the patient is using but one eye. A similar process takes place in cases of strabismus or high aniseikonia. When the vision of one eye is much below that of the other eye, there is a suppression of the poorer image with the visual axes deviating from parallelism. When there is a considerable difference in the relative size of the ocular images, the image of one eye is no longer combinable with the image of the other eye.

The theoretical conclusions reached in the research on aniseikonia may not be as significant to the average practitioner as is clinical data. Clinical experiences and considerations expressed in this paper, combined with that of others who are working in this field, have established aniseikonia as an important factor in the etiology of fusion anomalies. It accounts for the impairment of binocular vision in certain cases which were treated previously by means that proved inadequate.

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THE STABILITY OF "IMPROVEMENT" IN COLOR VISION DUE TO TRAINING — A REPORT OF THREE CASES*

Alphonse Chapanis†
The Johns Hopkins University
Baltimore, Maryland

During the war years many young men, eager to enlist their services in the Air Forces, Marines or Navy, were rudely shocked to discover that they had defective color vision. The more enterprising of these individuals, unconvinced by the medical findings, tried to circumvent this barrier to their goals in one way or another. Some obtained copies of color vision tests and memorized them with the help of sympathetic friends; others consulted certain optometrists and received color vision training from them. Either type of training was sufficient in most cases to enable the men to pass successfully the color vision tests administered at recruiting centers. The practice of training men on color vision tests has been severely criticized by some visual experts—Bridgman and Hofstetter[2] and Murray [12], for example—and a recent report by Farnsworth[5] concludes that "the best informed and most experienced specialists in the field of color vision are emphatically of the belief that congenital color deficiency cannot be remedied by the use of diet, medicine, training or other treatment now known to science." Farnsworth's report contains an extensive bibliography and the interested reader is referred to it for material not cited in this note.

One method of "reconditioning" the color blind requires the subject to look at red and green lights for long periods of time with practice trials on pseudo-isochromatic tests interspersed at intervals.[11, 14] Another, and essentially different method of "improving" color vision which has received considerable notice in this journal is that devised by Dvorine.[5] Dvorine,[6, 7] Lepper,[11] and Smith[14] cite numerous case studies of men who, once rejected by the services, were able to pass color vision tests after a period of training. These are facts which cannot be

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†Member of faculty, Psychological Laboratory, Department of Psychology. Member of the Optical Society of America. Fellow, American Psychological Association. Member, American Physiological Society and member of the Inter-Society Color Council.

disputed. But there are at least two possible interpretations of these findings: (1) The training produces a genuine improvement in color discrimination. (2) The training teaches the men to decipher the plates by means of cues which are present in most pseudo-isochromatic tests because of their faulty construction. According to the latter view, training produces no genuine improvement in color discrimination, but merely enables a man to pass a particular test.

Bridgman and Hofstetter,[2] Farnsworth and Reed[9] and Ross and Mueller[13] have shown by experiment that it is possible for color deficient men to improve their scores on the American Optical Company test through practice. Bridgman and Hofstetter pointed out, however, that this improvement occurred only if the men (a) were told or could figure out when they made mistakes and (b) were allowed to examine the plates. If the men were tested, "trained" on materials which did not include the test, and then tested again with no help from the examiner on the second examination there was no evidence of improvement. The latter finding is also confirmed by Gallagher *et al*[10] on different tests from those used by Bridgman and Hofstetter. Ross and Mueller pointed out some of the fine cues, ordinarily unnoticed by the color normal, on which color defective men will rely in memorizing the plates. Bridgman[1] has also discussed in detail the theoretical reasons why improvements in performance on pseudo-isochromatic tests are not satisfactory evidence of improvement in fundamental color sensitivity or in the ability to make everyday color discriminations.

An important kind of evidence on this problem would be test results on men who had once been trained successfully but who have had no opportunity for a number of years to see the tests on which they were trained. If training merely teaches men cues to decipher a set of plates, one might anticipate that in time they would have forgotten many of the cues. Experimental data on this point are conflicting. Smith,[14] for example, found that improvements with his method of training persisted over a period of "many months." Gallagher *et al*,[10] on the other hand, found a considerable diminution in ability to make correct responses to the AO and Ishihara tests "several months" after initial training. It is still possible to argue, however, that the diminution in the study by Gallagher *et al* occurred because these investigators did not use the correct kind of training initially.

Still another kind of evidence would be the results obtained on an entirely different test. If training does not improve color discrimination but merely helps men to decipher a particular set of plates by means of specific cues, one might anticipate that these men would be

unable to read an entirely different set of plates which they were seeing for the first time. Both Bridgman and Hofstetter[2] and Gallagher *et al*[10] have evidence which confirms this expectation. Here again, however, it is possible to argue that these investigators did not train their subjects correctly in the first place.

The author recently has examined three men who provided data of both types mentioned above and it is the purpose of this note to discuss their test performances. Two of these cases are of special interest because they had been trained by optometrists.

THE TESTS USED

During the last few years the author has been using a battery of several color vision tests, and the individuals to be described in this note were tested with all of them. The tests are the following:

1. An experimental, six plate, pseudo-isochromatic test devised by the author. Only a brief description[3] of this test is available in the literature, and a feature of it worth mentioning here is that it is designed to eliminate those cues which the color defective have used in memorizing such tests as the Ishihara and AO. Since there is only one copy of this test in existence, there is no possibility that any of the three men could have seen it before their respective examinations.

2. C. G. Boström and I. Kugelberg: *Tabulae Pseudo-Isochromaticae: Tavlor for Fargsinnesprövning*. Printed by Kifa, Stockholm, 1944. Distributed by the Nordiska Bokhandeln, Stockholm.

This is a foreign test and it appears to be relatively unknown in this country. It is also important to point out that this test is constructed according to different principles from those used in the Ishihara and AO tests. It is unlikely that any of the three men could have had an opportunity to examine it, and all denied having seen it before. The following plates from this test were used: 1, 2, 3, 4, 5, 6, 9, 10, 11, 12, 13, 14, 16, 17 and 18.

3. S. Ishihara: *Tests for Colour-Blindness* (9th Edition). Printed by Kanehara and Company, Tokyo, 1940. Distributed by the C. H. Stoelting Company, Chicago, Illinois.

Two of the men, A and B, recalled having seen this test (or an earlier, but essentially identical edition) in the course of their training; the third man, C, had trained himself and so was sure that he had never seen it before. In the examination here, the men were asked to read all plates with the exception of numbers 18 through 21, and 26 through 32. It is important to notice that 15 plates on this test are common to those found in the AO test described below.

4. *Pseudo-Isochromatic Plates for Testing Color Perception.* Engraved and printed by the Beck Engraving Company, Inc., New York, 1940. Distributed by the American Optical Company, Southbridge, Massachusetts.

All three men saw this test repeatedly in the course of their training and all identified it as the one which they successfully passed at naval or marine recruiting centers. In the examinations here, the men were asked to read all the plates on this test with the exception of numbers 26, 29, 33, 34, 45 and 46.

The last three of the tests listed above have been subjected to a critical evaluation by the author.[4] In addition, all of them have been used in another investigation, as yet unpublished, on 573 individuals. These data were collected in December, 1947, during the Baltimore Sesquicentennial Exhibition at which the author had a booth and tested all visitors who volunteered. Illumination on the tests came from two Macbeth daylight lamps (Type ALS 30) which provided 30 foot-candles of light of about 5,000°K. The test distance was 32 inches. Examinees were given unlimited time to read the plates but they were given absolutely no help in identifying any of them. The standard reply to all leading questions was, "What do you see?" or "How does it look to you?" Whenever an examinee gave two or more responses to the same plate, he was asked to name the "best" or "clearest" one. Only these "best choice" responses were scored. A strictly literal scoring procedure was used. In order to be counted correct, the examinee's response had to agree exactly with the answer given in the test manuals. The results are shown in Figures 1 to 4 and these data will provide the norms for evaluating the test performances turned in by the three cases to be described.

CASE A

A was a white male, 26 years of age, who presented himself for examination during the original tests mentioned above. He stated that he had applied for the Marine Corps about 4 years earlier, had been rejected, and had consulted an optometrist for training. He could not recall the name of the optometrist, but he did recall having been trained with red and green lights. He also recalled having been trained on both the AO and Ishihara tests. His performance on the four tests is shown in Figures 1 to 4. On the author's test, A saw absolutely no numbers, although he was given every encouragement to report what he saw. On the Boström-Kugelberg test, A saw nothing on 14 plates; he hazarded a guess for the fifteenth plate but his guess was wrong. On the Ishihara he saw 1 plate correctly and on the AO test, 6 plates.

Fig. 1

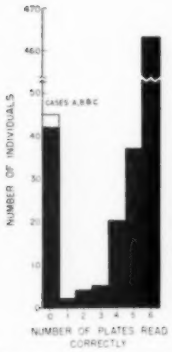

Fig. 2

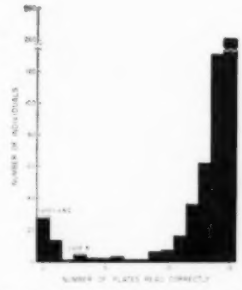

Fig. 1. Scores earned on the author's color vision test by 573 visitors to the Baltimore Sesquicentennial Exhibition. Also shown here are the scores earned by the three individuals described in this note.

Fig. 2. Scores earned on the Boström-Kugelberg color vision test by 573 visitors to the Baltimore Sesquicentennial Exhibition. Also shown here are the scores earned by the three individuals described in this note.

Fig. 3

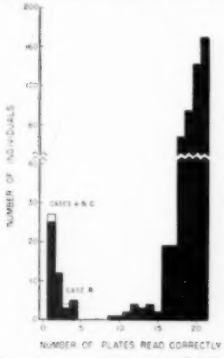

Fig. 4

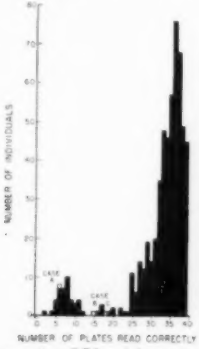

Fig. 3. Scores earned on the Ishihara color vision test by 573 visitors to the Baltimore Sesquicentennial Exhibition. Also shown here are the scores earned by the three individuals described in this note.

Fig. 4. Scores earned on the American Optical Company color vision test by 573 visitors to the Baltimore Sesquicentennial Exhibition. Also shown here are the scores earned by the three individuals in this note.

A did not seem surprised by these findings. He stated that he volunteered for the tests because he had reason to believe that his color discrimination had not been improved.

CASE B

B is a white male, 21 years of age, who presented himself for examination at the author's laboratory recently. This young man had

attempted to enlist in the Army Air Forces in 1944 and had been rejected for color deficiency. He underwent a series of training exercises in December 1944 and January 1945 and, at the conclusion of this training, was able to pass the Navy test (the AO). B has not seen any color vision test since August, 1945.

In the author's laboratory, B was tested under a Macbeth daylight lamp (Type BSXV 4) which provided 50 foot-candles of illumination of about 6,500°K. In other respects, the test conditions were similar to those used in obtaining the mass of data shown in Figures 1 to 4. B's test performance is also identified in these figures. On the author's plates, B saw absolutely nothing. On the Boström-Kugelberg plates, he saw nothing on 10 plates. He ventured responses to 5 plates, 3 of which were correct. On the Ishihara plates, B saw 3 plates correctly, but he was able to give the correct response for 8 additional plates. These plates were all of the "vanishing-figure" type, i. e., the normal is supposed to see one number, the color defective another. In each case, B admitted frankly that he saw both sets of numbers, but that the numbers which the color defective are supposed to see were much clearer. He also admitted quite frankly that he remembered the correct answers to some of these plates because of their unusual design. On the AO plates, B saw 15 plates correctly. He saw "something" on many of the other plates and kept complaining because he was not allowed to trace out what he saw with his finger.

It is quite evident from the above that the training B has received was detectable in his test performance some years later. In 1949, he saw absolutely nothing, i. e., he could not decipher anything, on 8 of the 39 AO plates he was shown. Similarly he could not decipher anything on 8 of the 21 Ishihara plates he was shown. On 16 of the AO plates, and 10 of the Ishihara plates, he saw "something" but what he saw most clearly was wrong. These findings, therefore, are consistent with the hypothesis that B had forgotten some of the specific cues which, at one time, enabled him to pass these tests.

At the conclusion of the examination, B was able to form his own conclusion about his color vision capacities at the present time.

CASE C

C is a white male, 26 years of age, who also presented himself for examination at the author's laboratory recently. Having failed the color vision examination at an Army Air Forces recruiting center in 1944, he secured a copy of the AO test and spent some time studying it with the help of a friend. Following this training, he was able to pass the examination. It is important to note that C needed no special

training with lights or colored dots to improve his score. He merely needed time to study the plates and someone to point out the correct answers.

C was examined under test conditions identical to those used in testing B. He saw nothing on the author's test and the Boström-Kugelberg test. On the Ishihara he saw 1 plate correctly and on the AO test, 18 plates. As in the case of B, however, C stated that he could have earned a much better score had this test been important to him. He stated that he knew many of the correct answers, that he could see parts of the correct numbers vaguely, but that in most cases, the incorrect numbers were much clearer to him.

DISCUSSION

Although this is indeed a small sample on which to base conclusions, these data are important in providing us with a partial answer to the value of color vision training. All three men, when given two tests they had never seen before, failed beyond any shadow of a doubt. When examined with tests which were used in their training, all three turned in poor performances on the Ishihara test: one turned in a poor score and two turned in moderately good scores on the AO test . . . *when the tests were taken honestly by the examinees concerned.* If these examinations had been important to the careers of these men, two of them, B and C, could have made much better scores on several plates by giving numbers which they knew to be correct but which they honestly did not see as clearly as the incorrect numbers.

In addition to providing normative data for evaluating the performances of the men discussed here, the data exhibited in the figures are important for theoretical purposes as well. All four figures show clearly that most people are able to read all, or nearly all, the plates correctly on these tests. But there is also a sizeable proportion of individuals who miss all, or nearly all, of the same plates when they are tested under identically the same conditions. The two groups are, for the most part, quite distinct. Put bluntly: Most people read these plates easily and without any training: a few people just don't see anything under the same conditions. Clearly, there is something markedly different about these two groups of people. It is important to understand that this is not a matter of "color ignorance" or color naming, because none of these tests requires the examinee to name a single color. Irrespective of what these colors might be called, certain critical dots on these plates look markedly different to most people. But to other people the same critical dots do not look different. The latter individuals are the color deficient ones.

It is also important to understand that visual acuity, within the limits of about 20/10 to 20/100, has little or nothing to do with performance on these tests. The author measured the acuities of the 573 individuals who contributed the data shown in Figures 1 to 4. There was no significant correlation between visual acuity and color vision test scores.

Color vision experts have long known that it is possible to reveal the correct numbers on many AO and Ishihara plates by having color deficient examinees view the plates through a red or green filter. What happens is that the brightnesses of the critical dots are altered sufficiently to make them distinctive. The color normal individual is not particularly impressed by the demonstration because the filter destroys the color differences which to him are far more distinctive than the brightness differences produced by the filter. When B and C viewed the AO and Ishihara charts through a red filter, they were astonished at what they saw. Both admitted freely that at no time during or after their training did they ever see the correct numbers as clearly as they did through the red filter. This the author believes, is further evidence that their training did not, in any sense of the word, make them equal to normal individuals in color discrimination.

SUMMARY AND CONCLUSIONS

The author examined three men who, during the war years, were rejected for military service because of color deficiency. Two of these men received training on color vision tests from optometrists; the third obtained a copy of the test and trained himself with the help of a friend. All three were also eventually able to pass the color vision tests given at recruiting centers. The author's examination included two tests which these men had never seen before. All three men failed these tests without any question. When examined with tests which had been used in their training, the three men failed when they took the tests honestly. Two of the men, however, could have achieved considerably better scores if they had relied on their memories for specific cues and had given correct answers, even though they did not honestly see the correct numbers as clearly as the incorrect ones. There is, in short, no evidence here that training had any genuine effect on their color discrimination. The training was useful, however, in enabling these men to pass the tests on which they were trained by making use of cues which the color normal person never needs to use.

DEPARTMENT OF PSYCHOLOGY
MERGENTHALER HALL
BALTIMORE, 18, MARYLAND

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ABSTRACTS

GLASSES ARE HIS HOBBY. Special Report. Bausch & Lomb Magazine. (Rochester, New York.) 25.2.8-9. 1949.

According to this report, Mr. Pitt Herbert, a staff member of B & L, is one of the world's authorities on the early history of eyewear. Herbert has a large collection of early and 19th century eyeglasses and spectacles, along with articles and monographs relating to their manufacture. These early frames, listed in order of their appearance, from the time spectacles were first invented, were made of wood, pewter, leather, brass, copper, ivory, tortoise shell, bone, horn, iron, silver, gold, steel, white metal, gold filled material and zylonite. 16 illustrations.

C. C. K.

ORTHOPTIC TRAINING USED IN CORRECTION OF LATENT HYPEROPIA AND EXOPHORIA— A CASE REPORT*

Frank W. Acker†
Santa Monica, California

CASE HISTORY

Mrs. L. C. H., fifty years of age, had been wearing the present prescription for about three months. This correction was O. D. +2.00 D. sph. ⊂—0.25 D. cyl. axis 45. O. S. +2.50 D. sph. ⊂—0.25 D. cyl. axis 90. Add. O. U. +1.75 D. sph. Visual acuity with this correction was O. D. 20/25—1. O. S. 20/25—2. O. U. 20/30. The previous correction was worn for four years: it was as follows: O. D. +1.50 D. sph. ⊂—0.50 D. cyl. axis 40: O.S. +1.75 D. sph. ⊂—0.25 D. cyl. axis 100. Add. O. U. +1.00. The patient had her first examination about twelve years ago when she complained of having trouble while threading a needle.

The general health of this patient seemed good. The patient had childhood diseases of chicken-pox, measles, and smallpox, all without event. She had no serious illnesses since then. She had some dental trouble periodically and all teeth were removed in 1942. She had full upper and lower dentures.

The patient, by occupation, was a housewife. Her visual requirements were for house work, sewing, and an average amount of reading with good lighting conditions.

The patient complained of "having headaches." "They ache way back in my head. I have these headaches most of the time." She wanted to know why her present glasses gave her discomfort, however, she said she was told that she had waited too long between examinations. The patient also stated that her judgment of distance was often incorrect.

PRELIMINARY FINDINGS

External examination: The lid margins were normal and the iris margins were sharply defined. Pupillary reflexes, direct and consensual, were sluggish to light and accommodation. The cover test

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†Optometrist. Fellow, American Academy of Optometry.

showed evidence of high exophoria at near. Confrontation test shows no apparent loss of field.

Ophthalmoscopic examination: The media was clear and the fundus ground appeared healthy. Apparently there was normal physiological cupping of the disks which were very sharply defined and clear. There was no apparent degeneration of the fovea, and the macular region was normal. There was some tortuosity of the vessels; however, the size ratio appeared to be normal.

ANALYTICAL EXAMINATION

Ophthalmometer:	O.D. 43.87 at 90	43.25 at 180
	O.S. 44.62 at 90	43.00 at 180
Static Retinoscope:	O.D. +2.50 sphere	
	O.S. +3.00 —0.50 x 90	
Dynamic Retinoscope:	O.D. +4.00 sphere	(Gross)
	O.S. +4.50 —0.50 x 90	(Gross)
Subjective:	O.D. +2.75 —0.25 x 90	
	O.S. +2.75 —0.25 x 90	
Induced Phoria:	4 Exophoria	
True Adduction:	8Δ	
Convergence:	28/—1	
Abduction:	28/—4	
Vertical Phoria:	Orthophoria	
Unfused Cross Cylinder:	O.D. +4.50 —0.25 x 90	(Gross)
	O.S. +4.50 —0.25 x 90	(Gross)
Induced Phoria:	20 Exophoria	
Fused Cross Cylinder:	O.D. +4.25 —0.25 x 90	(Gross)
	O.S. +4.25 —0.25 x 90	(Gross)
Induced Phoria:	14 Exophoria	
Tolerance Adductive Stimulation:	20	
Positive Fusional Reserve:	25/18	
Tolerance Adductive Inhibition:	15	
Negative Fusion Reserve:	28/24	
Amplitude of Accomodation:	O.U. 3.50	
Tolerance of Accommodative Stimulation:	—0.75	
Tolerance of Accommodative Inhibition:	+2.25	

The patient was given the visual skills test (Keystone) and the following was noted: (1) Poor fusion at far and near. (2) High exophoria at far and near. (3) Poor stereopsis.

With the increase in plus and the high exophoria as well as the poor visual skills it was assumed this patient would not be relieved of symptoms if an increased plus prescription were given. Therefore, it was explained that visual training was necessary before a new prescription could be worn which would meet her visual requirements as well as relieve her discomfort. The patient was very highly motivated and therefore psychologically ready for training. Since her general health was good, it could be assumed she would respond to orthoptic training.

Training was initiated and the patient was given twenty sessions with emphasis upon rotations (both monocular and binocular), fusion

training, cheiroscopic drawing, eye and hand coordination work with pointers, and followed by specific training to force plus acceptance without excessive increase in exophoria.

At the beginning of training the patient experienced severe intra-orbital pain shortly after a session involving rotations either monocular or binocular. This discomfort continued for several hours but the patient stated that she consistently was free of these symptoms in the mornings which would suggest no pathological origin. Gradually as her rotations became normal the pain disappeared.

Previous to training the patient had great difficulty in judging distance. This was particularly noticeable when placing objects on tables or desks, hanging clothes, or stepping on or off curbs. This would suggest poor space perception both at far and near. For this reason special emphasis was placed on hand and eye coordination through plus lenses. In the beginning this skill was almost absent. Suppression and diplopia were demonstrated. In comparatively few training sessions this showed great improvement. This skill carried over into her visual performance outside of the office.

To supplement office training, simple home exercises were suggested. These were the "pencil push-up" and training for quick, accurate fixation from far to near. The patient was very cooperative.

Upon completion of the orthoptic training, another analytical examination was given.

SECOND ANALYTICAL EXAMINATION

Static Retinoscope:	O.D. +2.50 Sphere	
	O.S. +3.25 —0.50 x 90	
Dynamic Retinoscope:	O.D. +4.50 Sphere	(Gross)
	O.S. +5.25 —0.50 x 90	(Gross)
Subjective:	O.D. +2.50 Sphere	
	O.S. +3.25 —0.50 x 90	
Induced Phoria:	4 Exophoria	
True Adduction:	8Δ	
Convergence:	20/1	
Abduction:	21/0	
Vertical Phoria:	Orthophoria	
Unfused Cross Cylinder:	O.D. +5.25 Sphere	(Gross)
	O.S. +6.00 —0.50 x 90	(Gross)
Induced Phoria:	15 Exophoria	
Fused Cross Cylinder:	O.D. +5.00 Sphere	(Gross)
	O.S. +5.74 —0.50 x 90	(Gross)
Induced Phoria:	15 Exophoria	
Tolerance Adductive Stimulation:	12	
Positive Fusional Reserve:	21/2	
Tolerance Adductive Stimulation:	16	
Negative Fusion Reserve:	24/17	
Amplitude of Accommodation:	3.00	
Tolerance of Accommodative Stimulation:	—1.50	
Tolerance of Accommodative Inhibition:	+1.50	

At this time the visual skills showed adequate fusion at far and near with a decrease in exophoria at distance and some decrease at near. Stereopsis was increased as well. Acuity was improved to 20/20 O. U., O. D., and O. S. at far and near. Analytical findings indicated increased plus acceptance with a decrease in exophoria. Since the patient, following the training, no longer had discomfort, it was assumed the new prescription could be given.

The final presciption was written as:

O. D. +2.50 D. sph. Add. +1.75 D. sph.
O. S. +3.25 D. sph. ⌢—0.50 D. cyl. axis 90.
Add +1.75 D. sph.

SUMMARY

From the past prescriptions, patient's response, case history, and visual analysis, it was assumed this case was one of latent hypermetropia becoming manifest with an associated high exophoria resulting in discomfort to the patient. Visual training was given and upon completion a new prescription was given with instructions to return in one year for another analytical examination. The patient returned in six months for an adjustment of her lenses and reported complete satisfaction with no discomfort.

711 BAY CITIES BUILDING
SANTA MONICA, CALIFORNIA

ABSTRACTS

THE EFFECT OF MEASURING DRIVING ABILITY. E. D. Fletcher. Journal of the American Optometric Association. 20.9. 560-563. 1949.

The author who is Examiner in charge of Research, California State Division of Drivers' Licenses, has suggested certain tests to aid in improving driving ability. Special tests were devised to measure factors of skill and ability required for safe operation of motor vehicles. These tests proved capable of differentiating groups of "good" and "poor" drivers and, furthermore, they had an educational effect upon the drivers tested.

An individual can be somewhat physically deficient in ability to drive a car, but he may be a safe driver if he makes the necessary adjustments to compensate for his limitations. Variations in the efficiency of performance of "good" drivers were measured in terms of accident frequency before and after testing. A control group of an equal number of "good" drivers employed by the same company were not tested but their records for a similar period compared with the tested group. Following the administration of the special tests, the accident record of the tested drivers was found to be far superior to that of the untested drivers.

A similar procedure was followed for a group of "poor" drivers and a statistically significant lowering of accident and traffic violation record resulted in the tested group but not in the untested group.

Therefore, in addition to driver selection, the special tests are a valuable means of improving both good and poor drivers by revealing their driving limitations and showing them how to compensate for their limitations.

Unfortunately, the special tests are not described in this article.

R. E. B.

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ON THE PROCEDURE TO BE FOLLOWED IN APPLYING FOR MEMBERSHIP IN THE ACADEMY

Inquiries regarding the procedure for applying for Fellowship in the American Academy of Optometry have reached such numbers as to make the following report of the Committee on Admittance required reading for many optometrists, and for those whose applications are now in the hands of the Committee. To others, who may be interested, the Committee first presents the objects of the Academy. This is followed by more specific instructions to applicants setting forth the requirements and standards of practice, the admittance procedure with the required case reports and clinical examination.

ARTHUR P. WHEELOCK.

THE OBJECTS OF THE ACADEMY

The objects of the American Academy of Optometry shall be to further the development of optometrical sciences in its efforts to conserve human vision by:

Affording an opportunity for the presentation and discussion of the results of clinical and experimental research in visual problems.

Encouraging the scientific observation and reporting of exceptional and instructive conditions encountered in the practice of the individual Fellow.

Initiating and supporting, in suitable centers and institutions, research programs in optometric subjects.

The American Academy of Optometry fully realizes and willingly assumes its responsibilities of leadership in the field of professional optometry to the end that it will ever stand for those principles of high ethics, increased educational standards, and unselfish service to the public, as opposed to the forces of commercial agencies which seek to degrade every aspect of the profession.

That these principles may be accomplished in fact, the American Academy of Optometry has not only formulated, but is guided by a strict code of ethics. Furthermore, to assure continued maintenance of these standards, the Academy has adopted rigid entrance requirements.

INSTRUCTIONS TO APPLICANTS

STANDARDS OF PRACTICE

I. A candidate for Fellowship in the American Academy of Optometry must be of good moral character and must conduct his practice on a high ethical plane. Ground floor locations are acceptable only when ethical physicians and dentists practice in like manner in the immediate vicinity of the applicant. (Photographs of ground floor offices must accompany application form.)

II. Fellows of the American Academy of Optometry are forbidden from committing and condoning any of the following practices:

1. Sensational publicity.
2. Advertising (see Section IV below).
3. The display or advertising of merchandise or services.
4. Use of bold face type or block listing in telephone books or directories.
5. The use of promotional material or methods such as slogans, catch phrases, inducements, displays, circulars, etc.
6. Signs other than simple name plates.
7. Ground floor locations resembling a store.
8. Use of commercial equipment, such as cash registers, show cases, fitting tables, etc.
9. Fitting and/or servicing of eyewear other than in privacy.
10. Filling of ophthalmic prescriptions by dispensing for other refractionists, or selling ophthalmic devices.
11. Use of the word optician or words connoting the same in connection with the practice of optometry.
12. Public indorsement of any ophthalmic product.

13. Affiliation with any commercial venture which tends to discredit professional standing.
14. Itinerant practice of optometry.
15. Unethical, immoral, dishonest, or criminal conduct.
16. Incompetence in the practice of optometry.

III. Stationery and other printed material may bear only the name and degree; title and name with qualifying specialty; address; telephone number; office hours, and profession. Printing or engraving of eyes, spectacles, spectacle frames, words referring to the competency of the individual, is prohibited.

IV. The use of professional cards in newspapers, church or school organs, or other media is prohibited. NOTE: Such may be accepted after review by the Executive Council, providing the majority of men in other professions within the same community use similar cards. Samples of such cards, together with those of the other professional men in the community must be submitted with the application.

V. Name signs or plates displayed to public view must conform in size, shape, and design with those used by other professional men in the immediate community. Photographs of all such signs and name plates as well as photographs of those used by other professional men should be included with the application.

ADMITTANCE PROCEDURE

(1) The application, which must be in writing on the form provided by the Academy, is submitted to the national Secretary. (2) The Secretary notifies the Executive Council of the application and refers the file to the proper regional committee on admittance for investigation. (3) An investigation of the applicant's character, mode of practice and office is made. (4) Upon approval, the applicant is notified of the following requirements, case reports and examination. (5) Following the submission and approval of case reports (see below) the applicant is notified to appear for examination, by the regional committee on admittance. After satisfactorily completing his examination, the applicant's file is graded by the regional committee on admittance who reports their findings to the general chairman of the committee. The general chairman makes his report on the applicant to the Executive Council through the office of the Secretary. Final approval of the application rests with the Executive Council.

The complete file a candidate must submit to the national Secretary consists of the following:

1. Application and fee to the American Academy of Optometry.
2. A signed Fellowship Pledge.
3. All required photographs.
4. Samples of all printed material.

REQUIREMENTS FOR ADMITTANCE TO FELLOWSHIP

All applicants for Fellowship, upon due notice, shall be required to submit ten case reports from the applicant's own files, concisely and completely annotated as outlined in this Manual of Instruction.

All applicants* shall be required to appear before the examiners or other authorized examining body to take the clinical and/or written examination.

*When the applicant is a scientist, educator, or non-practicing optometrist, the above requirements may be waived providing the applicant receives the approval of the Committee on Admittance and the unanimous vote of the Executive Council.

PREPARATION OF CASE REPORTS

All candidates must submit and have approved ten case reports.

Upon approval of case reports, candidates will be required to pass a clinical and/or written examination. (Under no circumstances will a candidate be given either examination until he has completed his case reports.)

General Instructions

In the interest of uniformity and to facilitate review, the following arrangement has been adopted for reporting case studies. No report will be accepted unless all instructions have been carried out in full.

All reports must be in the office of the Secretary at least sixty days prior to date of examination.

Reports, together with field charts, graphs, and drawings, must be in triplicate, the original and first copy being sent to the Committee on Admittance, the second copy to be retained by the candidate. All reports, graphs, etc., become the property of the American Academy of Optometry, and will not be returned to the candidate. The Committee on Admittance will not accept the responsibility for loss of reports in transit.

Specific Instructions

Case reports and all supplementary data must be neatly typewritten, double spaced, on 8½ x 11 inch paper. All graphs, charts, etc., concerning the report should be included in the proper order. Each page must be numbered, and must bear the name and address of the candidate in the upper right hand corner.

Each individual case report should contain not less than 500 words, nor more than 2,000 words.

The cover sheet of each report must bear the following:

1. The general type of report (refractive, orthoptic, pathological, etc.).
2. Patient's initials and address.
3. A brief summary of the case (not more than ten lines).
4. Candidate's name and address.

Types of Cases

All reports must be of patients seen in the candidate's own practice, and may include:

1. Errors of refraction.
2. Muscle imbalances, squint, or amblyopia.
3. Reading problems and reconditioning.
4. Pathology.
5. Contact lenses.
6. Aniseikonic corrections.
7. Orthoptic procedures.

General Considerations

All reports should include the previous history and complaints at time of examination. The refractive findings must be described in conformance with those outlined in the following pages (see Outline of Case Reports) and must be designated whether gross or net. Procedures and observations which led to the final prescription or advice should be stated as clearly and briefly as possible.

If the report is one of pathological nature, it must be fully and concisely described, giving your diagnosis, together with the diagnosis, name, and address of the ophthalmologist to whom the case was referred. Reports of pathological cases should include a line or two as to the final disposition of the case.

Reports on orthoptics must be brief and clear, giving dates of first and last conditioning periods, reason for procedure adopted and final results.

Summary

A summary of the important phases of each case should be included in the report. This summary should indicate the reason for the particular procedure selected, and should be sufficiently broad as to indicate knowledge of other and alternate methods.

OUTLINE OF CASE REPORTS

Item 1. *Case History:* A complete case history must be recorded to include:

Ocular History—must be detailed.

Health History—including all illness, accidents, operations, nasal, throat, dental and sinus conditions.

Family History.

School History.

Occupation—including working conditions and illumination.
Social and Recreational History.

Complaints: Must be recorded in patient's own words.

Item 2. *Preliminary Findings:*

External examination — lids, sclera, etc.
Versions.
Rotations.
Pupillary reaction to light — direct and consensual and to accommodation.

Item 3. *Ophthalmoscopic and Other Tests for Pathology:* These findings *will not* be accepted if recorded "negative" or "normal." A complete description must be made of the intra-ocular status of the eyes. Example: "The disc is of good color, well defined, etc."

Cupping.
General Fundus Conditions.
Arterio-venous ratio with note of crossing phenomena or any changes in the vessel walls, existence of lesions, exudates, or tissue destruction or any other fundus pathology.
Condition of all media.
When required, take Color and Form Field, Chart Blind Spot, and Check for Scotomata.
Prove ability to recognize the presence of ocular pathology, and to reasonable extent, those cardinal bodily ills which manifest in eye symptoms as indicated by patient's history or by any other means of optometric analysis.

Item 4. *Analytical Examination:* (minimum requirements).

Ophthalmometer.
Retinoscopy—Dynamic and Static.
Manifest or Subjective at distance.
Phorias and ductions both far and near.
Subjective at near as manifested in fused and unfused cross-cylinder findings.
Equilibrium, blur-points, or other such qualifying tests.
Fusion.
Stereopsis.
Accommodative response.
Tests for macular and peri-macular suppression (must show ability to check the integrity of all monocular and binocular skills).

Item 5. *Orthoptics:* When employed explain fundamental purpose of orthoptics and give an outline of procedure.

The findings that lead to the conclusion that orthoptics would be beneficial in this particular case.

The particular visual functions that would be improved by orthoptics and/or visual training.

The overall objective of orthoptics in this particular case.

The specific methods and procedures to be applied.

A session by session record of procedures applied and results attained, will prove helpful to the examiners.

The final outcome and disposition of the case.

Item 6. *Diagnosis and Treatment:* This need not necessarily agree with those of the committee members, but the philosophy or reasons underlying the suggested and followed course must be valid. The significance of all findings must be written out. A diagnosis of the difficulty, together with reasons for having arrived at this conclusion must be given. The prescription given (or not given) and the care and advice given to the patient must be included. A general statement as to prognosis and care of case must be made.

CLINICAL EXAMINATION — PROCEDURE AND POLICY

All candidates* are required to pass both clinical and written examinations.

It is Academy policy to permit the candidate to follow his own routine of clinical refraction and to keep his own records. The Academy is not interested in the candidate's particular philosophy of refraction *per se*, but it is interested in the candidate's ability to follow that philosophy through to a logical conclusion. It is primarily interested in the candidate's ability to properly handle the patient throughout the entire routine from history-taking to final prescription—to make an accurate diagnosis, and to advise the patient accordingly.

WRITTEN EXAMINATION — PROCEDURE AND POLICY

Unlike some written examinations, wherein specific answers are required of certain questions, the Academy requires each candidate to review, analyze, and give his disposition of three cases (studies taken from the files of the American Academy of Optometry).

These reports are graded on several factors: (1) full recognition of symptoms indicated; (2) application of the procedure to fit the analysis made; and, (3) knowledge of the proper use of the procedures applied.

*See Requirements to Admittance to Fellowship.

SPECIAL REPORTS

NOTES ON COMPULSORY HEALTH INSURANCE*

R. W. Tubesing†
Richmond, Indiana

With all good will and the highly commendable purpose of providing the best of medical care to all the people in the United States, regardless of their ability to pay, Senators Murray and Hill have introduced Senate bills 5 and 1456, which would change completely the method of payment for all medical services that are included in the provisions of the acts. Senate bill 5 would enable all citizens to receive medical services, (maximum 60 days) and auxiliary services (including services of optometrists and others). Payment would be made by the government out of a tax of three per cent on all wages and earnings up to $3,600.00 a year for the first several years. After 1957, congress would determine the amount of the appropriations. Provision is made for each state to pay the premiums for those unable to pay under amendments to the Social Security Act.

Senate bill 1456 would strengthen and co-ordinate the existing health resources within each state; would encourage and stimulate voluntary enrollment and prepayment plans for hospital and medical care and would provide means of payment of subscription charges of health insurance for people financially unable to pay.

The latter bill is so ambiguously worded that it is difficult to determine just what it would do if enacted. It is possible that this bill is being put forward as an alternative bill with the probability that the full provisions of Senate bill 5 can be made active at a later time. Since it is likely that Senate bill 5 is the goal toward which the social planners of this country are working, we shall limit our discussion to its provisions.

Those in favor of this bill proclaim that it does not mean socialized medicine. Those who oppose, claim that it is a socialization of the medical profession. In a sense both are correct, but since we have a greater problem than one of semantics, we shall skip that controversy to discuss the fundamental merits of this type of federal legislation.

*Submitted on May 19, 1949, for publication in the June, 1949, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

†Optometrist. Fellow, American Academy of Optometry.

During the last several years we have seen an ever increasing number of federal laws giving greater security to citizens. This has been necessary because the variations in the economic cycle of the country have greater effect on the average citizen when he is a factory worker than when he is more-or-less self-sufficient on the farm. The fear of unemployment by the factory worker is based on the fact that once unemployment strikes, he no longer can have shelter, food, and clothing for his family. At the same time his farmer cousin still has a roof over his head and sufficient food to keep his family going. Unemployment compensation, old age benefit plans, and the various welfare acts are designed to meet the needs of our predominantly urban population.

The improvement of the general health of the nation is a much greater task than that of making adequate medical services available to the entire population. The Research Council for Economic Security* has this to say on this matter:

"The available evidence does not indicate that the system of financing medical care is a major factor in the health development of a nation, as reflected in its infant mortality and male life expectancy rates. Therefore, one should be careful in assuming that the adoption of any system of paying for medical care, compulsory or otherwise, will of itself make for a decided improvement in the health indices. But there is good reason to believe that better results might be expected from paying careful attention to the improvement of living standards, to good nutrition, the elimination of economic and social inequalities between races, development of medical facilities, preventive health measures, and other factors which directly affect the health of the people."

One of the best provisions in Senate bill 5 is the setting up of local health committees to study local conditions and to make recommendations for the betterment of the health of the community. These committees can be very effective in maintaining health standards at the community level. Senate bill 5 also recognizes that we need more physicians, particularly in certain areas of the country, and makes provisions for special aid to physicians establishing practices in these areas. Since a physician working in his own community is likely to take a greater interest in the health of this community, it would be well to consider the possibility of granting medical tuitions to high school graduates showing an aptitude for medicine on the promise that they practice in their own home communities. The plans for enlargement of hospital facilities and the erection of new hospital units in areas where needed, should await the training of an adequate number of physicians, nurses, and hospital attendants of all descriptions.

All these measures of the bill serve an excellent purpose, however, the payment of all medical bills for the entire population brings up some

*The Health of Nations, Publication No. 42, December, 1948 Research Council for Economic Security, 111 West Jackson Blvd., Chicago 4, Illinois.

serious questions. It should be remembered that we have, through our various welfare acts, made provisions for the medical attention to the indigent. It has been said that while the indigent and those who are financially well off receive excellent medical care, that the great middle income group of our country has difficulty meeting the expenses involved and therefore does not receive as good care as either of the other two groups. The average working man can certainly pay many of the bills for medical services for his family, but he is, or rather should be, vitally concerned about long term illness requiring specialized care. It is exactly this type of care over a long time which costs the most and could prove financially impossible to meet. Nevertheless, the government-proposed insurance plan and the plans promulgated by the various private insurance companies limit the length of time that such services are covered while paying for the comparatively small fees for incidentals as they arise. A health insurance system either private or governmental and paying for medical services in a similar manner as deductible automobile insurance would insure a family against bankruptcy in the case of severe and prolonged illness. It would also eliminate the hypochondriacs from cluttering up our medical services with needless calls. Yet it would provide for the average American in case he or any member of his family fell seriously ill, that competent and complete medical services would be available regardless of cost.

It should be born in mind that 20 to 30 years ago when private insurance companies first took on health and accident policies, many of them either went bankrupt or had their non-cancellable policies changed by special act of the government. The risks were too great insuring completely the health of the insured. Too many people were taking undue advantage of the situation. In view of this experience, is it any more likely that government sponsored complete health insurance would fare any better?

The proponents for Senate bill 5 estimate its cost to be four billion dollars annually. Others have estimated the cost as high as 18 billions and have based their estimates on the experience of the Veterans Administration. Probably no one knows how to estimate accurately what this would cost the United States Government. Other nations have found that similar plans cost a total of about 10 per cent of the national income to guarantee medical services for all illness to their citizens. Can we afford to enter in such a plan as this and add another 10 per cent to our taxes? Furthermore, can there be any justification of the claim that it is possible for the government to provide "free"

medical services to everyone? And finally, is it good practice for the government to assume such responsibility for the lives of its citizens, most of whom have always taken pride in their ability to pay their own way?

304 MEDICAL ARTS BUILDING
RICHMOND, INDIANA

A STUDENT'S VIEWPOINT ON PROFESSIONAL PRACTICE*

Harry M. Clarke†
School of Optometry, University of California
Berkeley, California

About this time of year the forthcoming graduates are giving thought to the practical application of the vast amount of theory they have been attempting to assimilate during the past few years. All feel keenly our lack of experience and wonder if we will be able to serve our patients as they deserve.

A grave responsibility rests upon the licentiate who has been trained to supply the finest professional eye care, and it is essential that this service be rendered in an ethical manner in a professional surround or its potency is destroyed. We know it is absolutely necessary to become professional *individually* if optometry is to attain the standing it deserves. The unscrupulous man who seeks to bask in the aura of professionalism that conscientious men give optometry without himself helping to build this mantle is shirking a moral obligation that is as real as the responsibility he assumes by accepting a license to practice. Becoming professional is like gaining experience. We do not get it in school or when we are granted the right to practice; we must attain it. It is an attitude, an ideal, a part of one's personality, and, when attained, is with one constantly. This may seem strange since we are entering a profession, yet individually we make it a profession.

The examples set by some men in practice are not stimulative to new men. The practitioner who apologizes for his window display or other unethical factors on the grounds that he has to compete with

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†Senior student, School of Optometry.

other men doing the same things is to be pitied for his short-sightedness. We should look to the leaders in the field of professional optometry for our inspiration.

We have only to look at the development of medicine and dentistry to see what we can make of our profession. We can speed the growth of optometry by maintaining individual professional standards and by vigorous support of organized optometry. The new men have the opportunity of working with a professional practitioner who is interested in the development of optometry by participating in the internship program. If he does not wish to intern, the new man may open a private professional practice and lend his support to organized optometry through participation in association activities.

There are two doors open to the new practitioner. One is the door to commercial practice which some will take because it appears to be a quick, easy way to economic success. Selection of this course is based upon faulty premises to begin with and entails isolation from one's colleagues, poor esteem by the public, and an inherent sense of guilt. Temporary economic success may be attained but this is much overrated when compared with a professional practice of ten years' standing. The man who launches into commercial practice has wasted his time acquiring his education. Does a man spend five years or so in training just to be able to get a license, or does he train himself with the intention of giving the public the best eye care possible? If the new man's intention is to serve the public to the best of his ability, there is only one way this can be done and that is by means of a professional practice which is the course that must be taken by every graduate if optometry is to attain the standing it deserves.

Making a living is a very important thing, but *how* you make it is important not only to your own self-respect and the respect of your potential patients and colleagues but it is also important for the future of optometry in general. As optometry approaches the goal of one hundred per cent professional practitioners, the public will manifest an increasing respect for and greater confidence in the individual optometrist. Success then depends only upon our individual application of our academic knowledge in a truly sincere professional manner.

CURRENT COMMENTS

Virginia Huck
Editorial Assistant

Optometrists will confer a favor by sending news items of general interest for this department: such as relate to new instruments, clinical techniques, education, visual health and optometric legislation and organization.

REPORTS ON ANISEIKONIA

Interest in aniseikonic research is growing both in this country and abroad due to the efforts of the recently organized Aniseikonic Forum. Dr. Conrad Berens, forum chairman, writes that German and English eye specialists have contacted him, reporting results of their work in this specialty. According to Dr. Berens, the plans laid out for the forum are going ahead rapidly, the promised bibliography on aniseikonia now being available upon request to the forum, care of Columbia University, 433 West 123rd Street, New York 27, New York. Included in the available material on aniseikonia will be two papers by Dr. Herzau (M.D.), chief of the ophthalmological clinic of the city health institutions, Erfurt, Germany.

On June 20, a one week postgraduate course in aniseikonia was given by Columbia University under the direction of Dr. Harold M. Fisher.

The American Optical company has announced distribution of the new space-eikonometers to Dr. Conrad Berens, New York City; Columbia University; Michel Loutfallah, Santa Barbara, California; Northern Illinois College of Optometry, Chicago; School of Aviation Medicine, Randolph Field, Texas; Wendell Triller, Hanover, New Hampshire; Ernest W. Sheppard, George Washington University, Washington, D. C., and Washington University, St. Louis, Missouri.

Lord Charnwood, London, England, Dr. Robert J. Walker, Winston-Salem, North Carolina and Dr. Samuel Swartz, Plymouth, Massachusetts have reported to the forum that they have made their own space-eikonometers and are using them in their practices.

Through the forum, lecture slides on aniseikonia recently were loaned to optometric groups in Pennsylvania and New York.

APPEAL FROM NATIONAL COMMITTEE OF CHILE

A special appeal for back issues of this Journal has been made by the National Committee for Chile. The magazines are needed to replace material destroyed in a recent fire at the Medical School Library, University of Chile. The blaze destroyed the newer materials in the library.

including books, periodicals and other reference material. Readers who can spare back issues of the *American Journal of Optometry*, medical periodicals or authoritative books on ocular refraction, are urged to send them to the National Committee for Chile, Library of Congress, Room 318, Washington, D. C.

NEWS BRIEFS

The Univis Lens Company is again producing its telescopic fitting sets. Each set contains one 1.5x unit in a trial ring, one 2.0x unit in a trial ring, with four reading caps for each of the units. . . . An article by Dr. Marguerite Thoma Eberl on children's vision is featured in the May issue of *Parents'* magazine. Arrangements for the article were made through the A. O. A. Department of Public Information. . . . The New Jersey Optometric Association went on record in May recommending that all legislation on national health insurance be amended to include the following points: (1) protection and preservation of the beneficiary's right to choose an optometrist without prior approval of a medical administrative officer or physician; (2) assistance to optometry colleges comparable to that proposed for other health professions; and (3) optometric representation on boards and councils established to administer any public health program. . . . Bausch & Lomb Optical Company has announced development of a new instrument that provides a directed beam of uniform light for close-up examination of the eye. The new instrument is known as the hand-eye illuminator, which has a light beam ranging up to 250 foot candles and a width of focus from 2 inches to ¼ inch. . . . The Kansas Optometric Association has gone on record opposed to any and all forms of public health care by the federal government. . . . Dr. Walter C. Kennedy of Sarasota, Florida, has been appointed Rotary District Governor of Florida.

ABSTRACTS

REPORT OF EYESIGHT SURVEY OF LEASIDE SCHOOL CHILDREN TO LEASIDE LIONS CLUB. A. A. M. Stemp. The Canadian Journal of Optometry. No. 2. 1949. pp. 52-59.

The author reports the findings of a study which included the examination and refraction of 2,150 students in the elementary and high school system of Leaside. 14 students were found to have some form of pathology of the eyes or lids. 349 students required refractive care. The remaining students were emmetropic. The author presents a breakdown of refractive findings by type of ametropia and age. 4 tables.

C. C. K.

TRANSACTIONS OF THE AMERICAN ACADEMY OF OPTOMETRY

A department devoted to announcements, reports, appointments, organization data, news, professional problems and ideals, as these relate to the Academy.

HOLLENDEN TO BE HOST TO ACADEMY AT CLEVELAND

Cleveland is all set to welcome Academy members December 10-13 for the annual meeting . . . and the Academy program committee is all set for Cleveland.

The Hotel Hollenden will be the headquarters for the Academy during the convention. Reservations may now be made, and the hotel has announced its rates as follows: (All rooms are equipped with bath or shower) Single rooms, $3.50 to $8.00; double (2) rooms, $5.50 to $10.00; and twin (2) rooms, $7.00 to $12.00. The address of the hotel is 610 East Superior Avenue, Cleveland, Ohio, near the theater and shopping districts.

Dr. Robert E. Bannon, chairman of the papers committee, reports more than 30 papers are already scheduled for the convention. The General Electric Company will be host to the Academy on Monday at Nela Park for a series of technical papers, a dinner, and a lighting demonstration.

CHAPTER ACTIVITIES

At recent meetings of Academy Chapters . . .

Florida members heard Dr. Eugene Freeman speak on "Professional Ethics."

Eastern Pennsylvania members elected the following new officers: Dr. Luther A. Garns, Philadelphia, president; Dr. John C. Neill, Philadelphia, vice-president; Dr. William G. Walton, Jr., Merion, secretary-treasurer; and Drs. Lawrence Fitch of Philadelphia, William O. Vivian, Media, and Fred W. Sutor, Philadelphia, as members of the executive council.

Michigan Fellows elected Dr. John Gregory, Benton Harbor, president; Dr. R. H. Tichnor, St. Joseph, vice president; and Dr. R. E. Van Sluyters, Grand Rapids, secretary-treasurer.

Southern California members heard Dr. William A. Pettit, leading California authority on ocular pathology at a dinner meeting. His subject was "Causes of Blindness in California."

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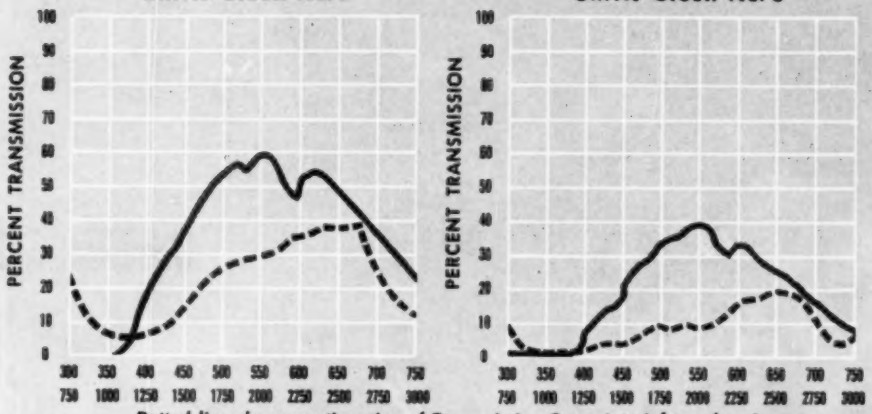

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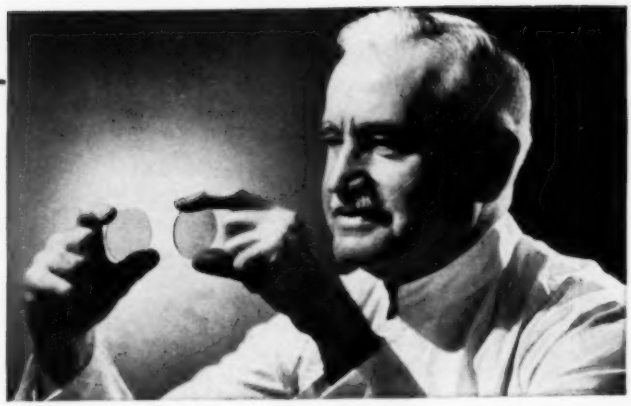

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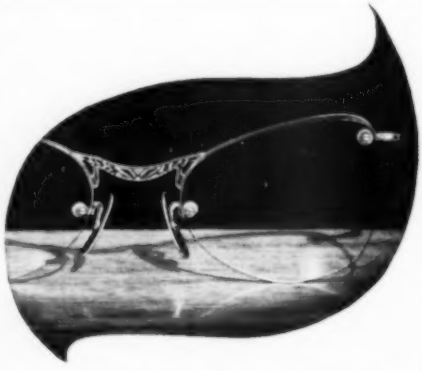

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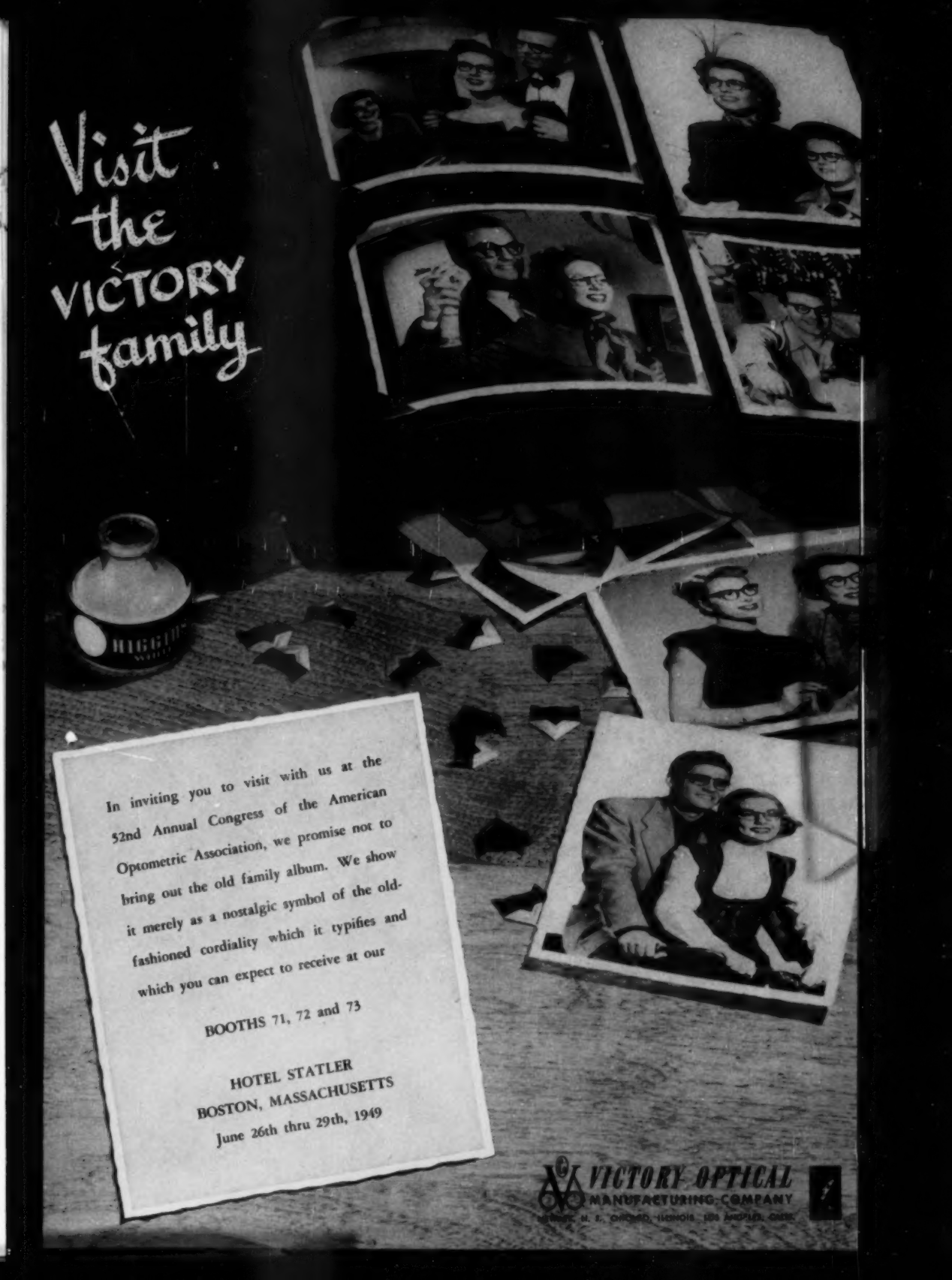
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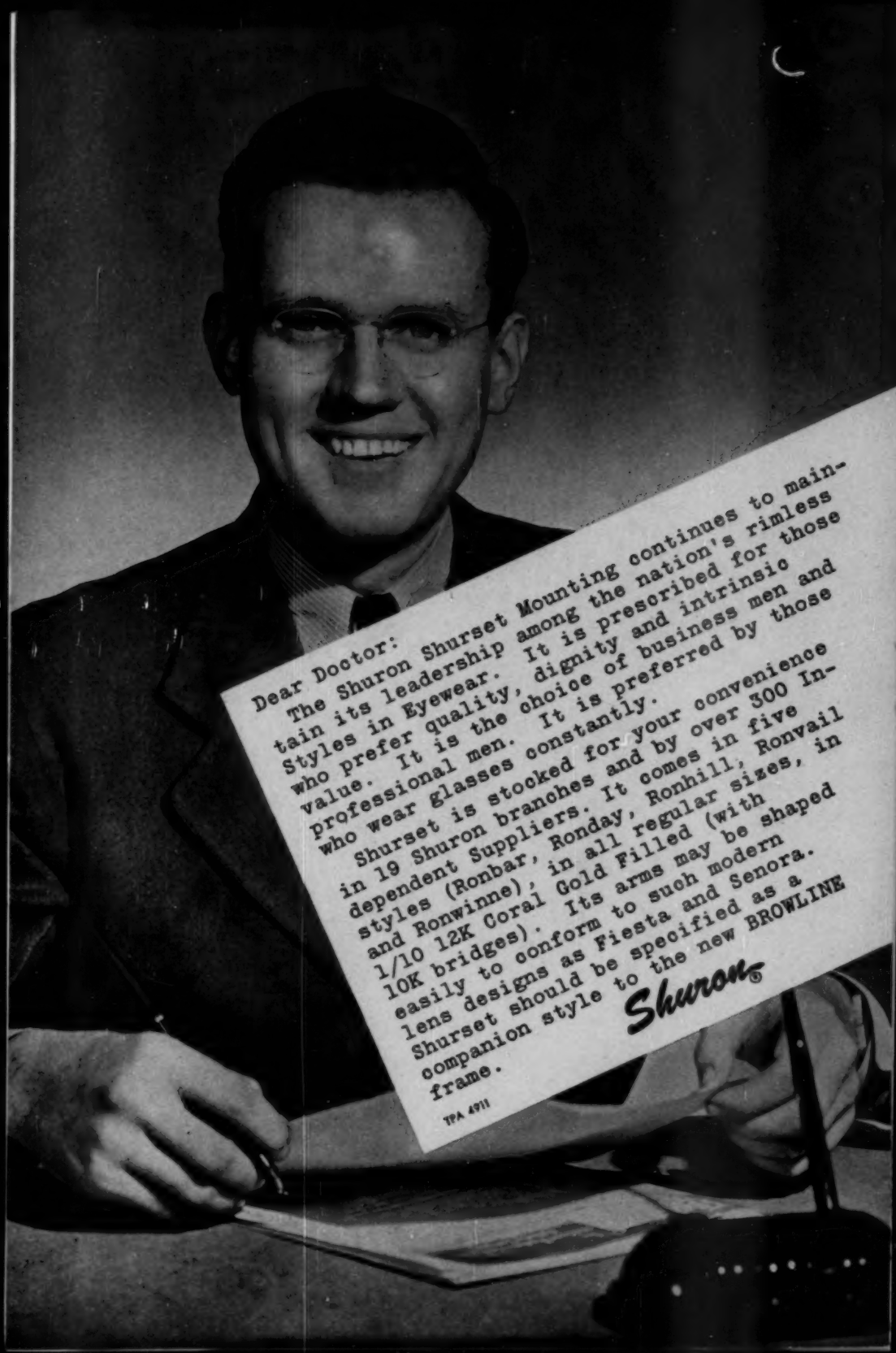
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